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A CONTRIBUTION TO THE MOSS FLORA OF TROPICAL AFRICA.

JANE TAYLOR and R. POTIER DE LA VARDE.

Our present knowledge of the moss flora of tropical Africa is so incomplete that it is desirable to pubish every list of determinations which may advance the regional cataloguing of the group. The following list comprises 57 numbers, collected over a period of twenty years (1933–1953) by various phanerogamists whose attentions were attracted by interesting ecological features. Four species *Fissidens jordanii*, *Dicranodontium tanganyikae*, *Stereophyllum macrocarpum* and *Heterophyllium scabrifolium* are described as new to science.

The systematic arrangement follows *Brotherus* in *Engler* and *Prantl*, Nat. Pflanzenf., 2 ed., X and Xi (1924).

ANDREAEALES

ANDREAEACEAE

Andreaea kilimandjarica *Par.*, Ind. Bryol., **30** (1894).

KENYA ; Mt. Kenya, on sheltered sides of crevices near snow line, 16100 feet IX-1947, *E. Wright* s.n.

BRYALES

FISSIDENTACEAE

Fissidens jordanii *J. Tayl.* et *P. de la V.* sp. nov. [subgenus **Octodiceras** (Brid.) Mitt].

Laxissime caespitosus. *Caulis* atro-viridis, rigidulus, plus minus arcuatus, 2–5 cm. longus, simplex. *Folia* 25–35 juga, 5–6 mm. longa, maxima latitudine 0·60 mm. lata, madore intus inflexa. Lamina vera aperta, ad $\frac{2}{3}$ longitudinis folii producta ; lamina dorsalis curvata in costam supra insertionem decurrens ; lamina apicalis anguste acuminata ; laminae omnes marginibus integris, summo apice excepto plus minus profunde dentato. *Cellulae* polygoniae subisodiametricae, 12·5 × 11μ, in laminis dorsalibus et ventralibus juxtacostales rectangulae, 12·5 × 7·5μ, omnes parietibus firmis. *Costa* valida, flexuosa, ante apicem evanescens.

Inflorescentiae axillares copiosae. Perigonia juxta rariora perichaetia posita. *Folia perigonialia* basi ventricosa, lamina apicali linguiformi sursum curvata. Antheridia (10–15) obovoidea, 125 × 50 μ, paraphysibus raris, brevibus et hyalinis mixta. *Folia perichaetialia* majora, lamina apicali acuta ; archegonia (5–6) 175 μ longa. *Theca* obovoidea, subsessilis, operculata 300 × 100 μ. Operculum aurantiacum, conicum, humile, rostratum.

Figs. A.–E. (p. 507).

Sierra Leone ; Mange, Bure, epiphytic on small shrub (*Croton scarceisii* Sc. Elliot) abundant on rocks now exposed in river. 5.1.1953. *H. D. Jordan* 851A typus (Herb. Kew.).

In having the apical lamina distinctly shorter in proportion to the " lamina vera " and uniformly ranked cells, this moss belongs to the group " Ab " of Brotherus which up to the present has only one African representative—*Fissidens amphibius* (C.M.) Broth. from Niam-Niam.

The latter species (according to its description) differs, in its slenderness, its terestrial habit, the " lamina vera " reaching scarcely half the length of the leaf and the dorsal lamina rounded or auriculate in the upper leaves. As *Müller's* herbarium was destroyed at Berlin it is impossible to examine his *F. amphibius* which he hesitated for a time to place in the subgenus *Octodiceras*. However there is no doubt about placing *F. jordanii* under *Octodiceras*.

Dicranaceae

Campylopus bartramiaceus *C. Müll.* var. **laevis** *P. de la V.* et *Thér.*, Bull. Soc. Bot. France, **87,** 353 (1940).

Uganda ; Kigezi, Mt. Mgahinga, common epiphyte on *Hypericum* trees, 10,500 feet. 24.VIII.1938. *A. S. Thomas* 2431.

Campylopus chevalieri *Broth.* et *Thér.*, Bull. Mus. Hist. nat. Paris, **18,** no. 6, 476 (1912).

Sierra Leone ; Bintumane Peak, on rocks near summit, c. 6,390 feet. 4.I.1951. *T. S. Jones* 109.

Campylopus eckendorffii *Thér.* et *P. de la V.*, Rev. Bryol. & Lichénol., **11,** 168 (1938).

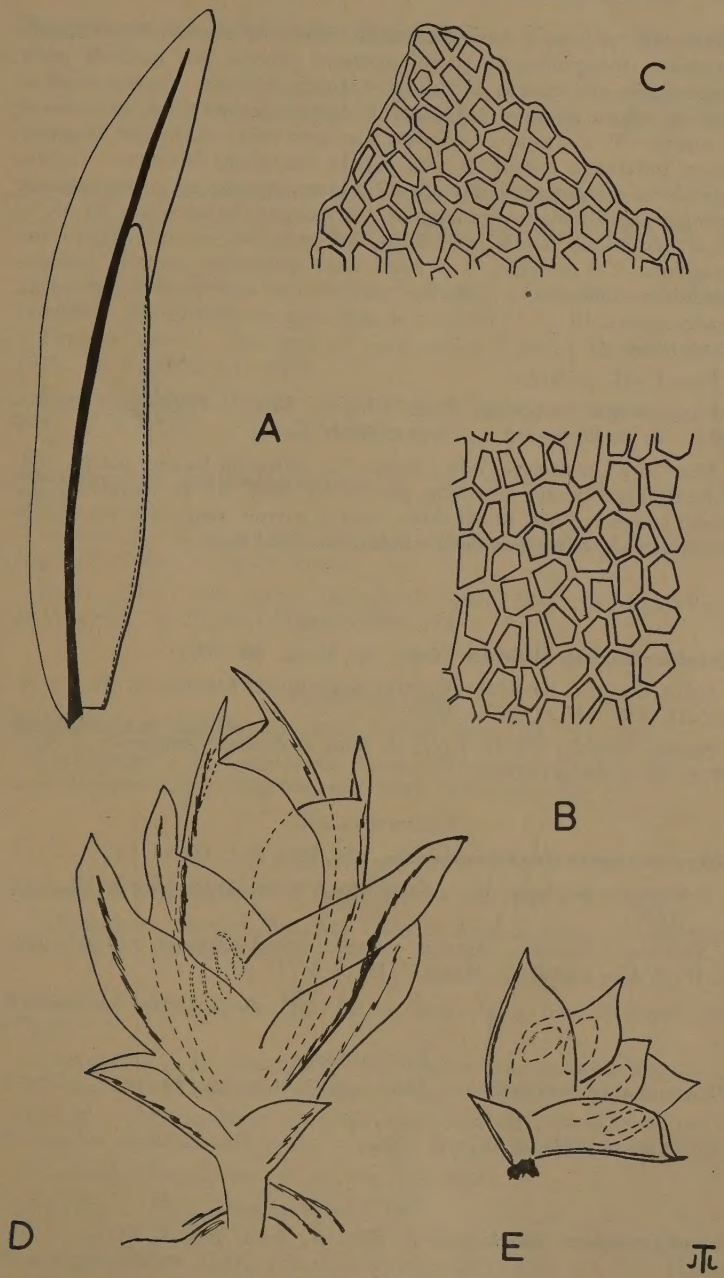
Sierra Leone ; Bitumane Peak, on rocks at 5,400 feet. 8.I.1951. *T. S. Jones* 149.

Campylopus introflexus (*Hedw.*) *Mitt.*, Journ. Linn. Soc. (Musc. Aust. Am.), **12,** 84 (1869).

Belgian Congo ; Keshero, on old lava flow near lake edge. 20.VII. 1951. *H. A. Osmaston* 1080.

Dicranodontium tanganyikae *J. Tayl.*, et *P. de la V.*, sp. nov.

Laxe caespitosum. *Caulis* flexuosus, 4–5 cms. altus ± divisus. *Folia* falcata, homomalla, in rosulis superpositis aggregata, 7–8 mm. longa



Fissidens jordanii J. Tayl. et P. de la V.

A, leaf (× 26) ; C, cells from leaf-apex (× 453) ; B, cells at one-third from apex of leaf (× 453) ; D, perichaetial bracts (× 58) ; E, perigonial bracts (× 58).

inferne 540 μ lata, e basi lanceolata sensim in acumen aequilongum extenuata, marginibus in parte superiore inflexis, pro maxima parte integerrimis, ad apicem profunde et acute dentatis. *Costa* conspicue definita, inferne ad basin 275 μ lata, in parte superiore dorso spinuloso et in summo 30 μ crassa. Auriculae basilares valde distinctae, brunnescentes, inflatae, e (circa) 30–35 μ cellulis hexagoniis formatae. *Cellulae* auriculares subisodiametricae, 25–30 μ latae, externe multo angustiores. Cellulae suprabasilares rectangulae vel elongato-hexagoniae, 50–55 × 10 μ, parietibus tenuis interruptis, ad margines sensim angustiores, marginales 2–3 seriatae, 3 μ circa latae parietibus integris, pseudolimbidium formantes. Cellulae mediae et superiores irregulariter quadrangulae, 15–17 × 10 μ, vel rhombeae, parietibus validis, in angulis crassioribus.

Figs. F.–H. (p. 512).

Tanganyika : Lupanga Peak, Uluguru Mts. c. 7,000 feet. 22.IV.1933. *B. D. Burtt* 4713 p.p. typus (Herb. Kew.).

Near to *D. circinatum* (Wils.) Schp. but differs in having porose cell-walls throughout the sheathing part of the leaf. In *D. tanganyikae* the border consists of two, rarely three, rows of narrow linear cells whereas in *D. circinatum* several rows form a broad marginal band.

Leucobryaceae

Octoblepharum albidum *Hedw.*, Sp. Musc., **50** (1801).

Gold Coast ; Kwadaso, Central Agricultural Station, on tree trunk. 16.XII.1951. *K. O. Darko* 706.

Sierra Leone ; Njala, Kori, on roots of *Bambusa arundinacea*. 10.X.1952. *F. C. Deighton* 5856.

Calymperaceae

Calymperopsis disciformis (*Dus.*) *Fl.*, Bibl. Bot., **19,** 5 (1913).

Syrrhopodon disciformis Dus., Kongl. Sv. Vetens.-Akad. Handl., **28,** 2, 17 (1895).

Nigeria ; Sapoba, Agbadi village, on *Brachystegia*. 14.XI.1949. *R. W. J. Keay* and *R. D. Meikle* U. D. 18, U. D. 23.

Pottiaceae

Pleurochaete beccarii *Vent.*, Nuov. Giorn. Bot. Ital., **14** (1872).

Belgian Congo ; Keshero, near lake edge on old lava flow. 20.VIII.1951. *H. A. Osmaston* 1079.

Bryaceae

Brachymenium lonchopus *P. de la V.* Arch. Bot. **1,** Mém., 3, 57 (1927).

Nigeria ; Kafogo, Kamabai–Kabala road, on *Parkia biglobosa* in orchard bush. 14.XII.1946. *F. C. Deighton* 4406.

Brachymenium philonotula (*Hampe*) *Broth.*, in Engl., Bot. Jahrb., **20,** 191 (1895).

TANGANYIKA ; E. Usambaras, Mkusi Lushoto, a common moss between bricks of steps in garden of *Greenway's* Cottage. 31.VIII.1950. *Verdcourt* 346.

Bryum albo-pulvinatum *C. Müll.*, Flora, **69,** 507 (1886).

B. subalbulum Thér. ex P. de la V. Bull. Soc. Bot. France, **72,** 357 (1925).

B. subalbulum Thér. var. *robustum* P. de la V., Rev. Bryol., **6,** Nouv. Sér., 143 (1933).

FRENCH GUINEA ; Macenta, on open rock, c. 2,000–2,500 feet. 14.X. 1947. *J. T. Baldwin* Jr. 9820.

KENYA ; Eldoret District. Oldan Sapuk, on lava pavements c. 7,000 feet. 27.VII.1951. *P. O. J. Greenway* 8537.

Rhodobryum spathulosifolium (*C. Müll.*) *Par.*, Ind. Bryol., 112 (1894).

UGANDA ; Ruwenzori, growing with orchids c. 8,600 feet, VIII.1953. *Eggling* E. 1386 Det. *H. N. Dixon.*

TANGANYIKA ; Morogoro District, Uluguru Mts., Lupanga Park. 22.IV.1933. *B. D. Burtt* 4713 p. p.

RHIZOGONIACEAE

Rhizogonium spiniforme (*Hedw.*) *Bruch*, Flora, **29,** 134 (1846).

TANGANYIKA ; E. Usambaras, Amani, Mt. Bomole, tufted colony on base of *Ocotea* 3,200–3,600 feet, 8.V.1950. *Verdcourt* 180.

BARTRAMIACEAE

Bartramia ithyphylla *Brid.*, Musc. Recent., **2,** pt. 3, 132 (1803).

S. ETHIOPIA ; Amaro Mts., Mt. Delo, in Bamboo forest at 9,600 feet. 18.1.1953. *J. B. Gillett* 14986.

Philonotis imbricatula *Mitt.* Journ. Proc. Linn. Soc. **3,** Suppl., 61 (1859).

TANGANYIKA ; E. Usambaras, on bare vertical roadside bank. c. 2,800 feet. 23.VIII.1950. *Verdcourt* 331.

Breutelia stuhlmannii *Broth.*, in Engl., Bot Jahrb., **20,** 192 (1895).

B. auronitens Negri, Ann. di Bot., **7,** 168 (1909).

UGANDA ; 1951. *Dawkins* s.n.

B. subgnaphalea (*C.M.*) *Par.*, Ind. Bryol., 154 (1894).

UGANDA ; Toro, Bunyangabo, Ruwenzori, pass from Rwagimba to Kahuka, open bog at 2,400 metres. 1.IX.1951. *H. A. Osmaston* 1260.

ORTHOTRICACEAE

Macromitrium dregei *Hornsch.*, Linn., **15,** 131 (1841).

KENYA ; Sololo, Burroli Mt., epiphyte on trunk of evergeeen trees, 4,600 feet. 7.IX.1952. *J. B. Gillett* 13796.

M. mauritianum *Schwaegr.*, Suppl. **2,** pt. 2, 127 (1824).

TANGANYIKA ; Amani, growing on the aerial roots of *Cytrorchis* at 3,000 feet. 9.VI.1950. *Verdcourt* 143.

Micromitrium sarcotrichum (*C.M.*) *Par.*, Ind. Bryol., 241 (1905).

NIGERIA ; Kafogo, Kamabai–Kabala road, on *Parkia biglobosa* in orchard bush. 14.VII.1946. *F. C. Deighton* 4406 p. p. ; Sapoba Agbadi village, on *Brachystegia* 14.XI.1949. *R. W. J. Keay* and *R. D. Meikle* U. D. 15 and L. D. 9.

RHACOPILACEAE

Rhacopilum africanum *Mitt.*, Journ. Linn. Soc. **7,** 162 (1864).

TANGANYIKA ; Ngongongare, on black volcanic loam c. 8,000 feet. 3.VIII.1951. *P. J. Greenway* and *J. Hughes* 8562.

SIERRA LEONE ; 26.XI.1952. *D. Small* s.n.

TRACHYPODACEAE

Trachypodopsis normandii (*Broth. et Par.*) *Broth.*

Trachypus normandii Broth. et Par., Rev. bryol. **29,** no. 3, 68 (1902).

SIERRA LEONE ; Bintumane Peak, on rock c. 5,400 feet, 8.I.1951 *T. S. Jones* 148.

METEORIACEAE

Pilotrichella communis *C. M.* in K. Sv. Vet.-Akad. Handl., n. 3 (1895).

SIERRA LEONE ; Gola Forest, Black III, epiphyte. 17.III.1952. *D. Small* 530 and 531.

P. sordido-viridis *C. M.* in K. Sv. Vet.-Akad. Handl. n. 3 (1895).

NIGERIA ; Sapoba, Agbadi Village, on *Brachystegia* 14.XI.1949. *R. W. J. Keay* and *R. D. Meikle* L. D. 2, L. D. 12, L. D. 14, and B. 3.

NECKERACEAE

Thamnium hildebrandti (*C. Müll.*) *Jaeg.*, Ad. Fl. Musc. **2,** 731 (1879).

Hypnum hildebrandti **C. Müll.,** Linn. **40,** 287 (1876).

UGANDA ; Imatongs, Aringa River headwaters, growing on boles at the base of trees and on rock faces in deep shady places on a stream bank 8,400 feet. 7.IV.1945. *P. J. Greenway* and *F. C. Hummel* 6304.

Porotrichum subpennaeforme *C. Müll.*, Flora, n.s. **48,** 488 (1890).

Tanganyika ; E. Usambaras, Msalai-Zarai, growing on damp rocks in shade of *Odendyea* in the bed of a forest stream c. 4,000 feet. 4.VIII.1940. *P. J. Greenway* 5975.

Fabroniaceae

Fabronia longipila *Broth.*, in Engl., Bot. Jahrb., **20,** 208 (1894).

S. Ethiopia ; Sessaganno ridge, epiphytic in evergreen forest 1,850–2,250 m. 19.I.1953. *J. B. Gillett* 14842.

Thuidiaceae

Thuidium laevipes *Mitt.*, Journ. Linn. Soc. Bot., **22,** 318 (1886).

Sierra Leone ; Kambui Hills, growing on damp shady rocks, 24.IV. 1953. *D. Small* 903 p .p.

Brachytheciaceae

Rhynchostegium horridum *Broth.* in Mildbr. Wiss. Erg. Deut. Zent.-Afr.-Exp. 1907–08, **2,** 173 (1914).

Tanganyika ; E. Usambaras, Derema, growing on a rotting stump in forest near Kwamkuyu Falls, c. 2,100 feet. 17.IV.1950. *Verdcourt* 158.

Entodontaceae

Entodon dregeanus (*Hornsch.*) *C. Müll.*, Linn., **18,** 706 (1844).

Uganda ; Kigezi, Kachwekano Farm, dominant moss in ground cover of hill-side thicket, 6,800 feet. IX.1949. *J. W. Purseglove* P. 3130.

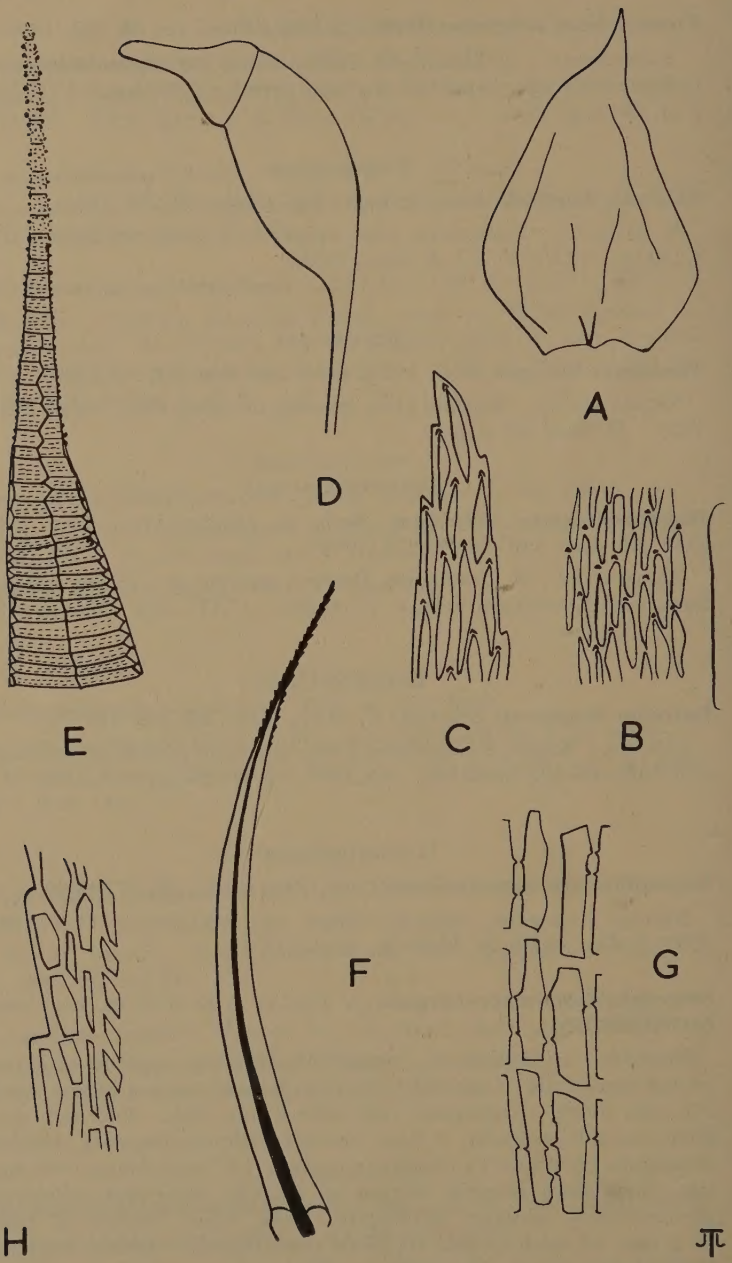
Plagiotheciaceae

Stereophyllum conterminum *Card.*, Rev. Bryol., **36,** 47 (1909).

Nigeria ; Sapoba, Agbadi village on *Brachystegia*. 14.XI.1949. *R. W. J. Keay* and *R, D. Meikle* B. 1 and L.D. 3.

Stereophyllum macrocarpum *J. Tayl.* et *P. de la V.* sp. nov. [sect. **MONEURIUM**].

Corticola ; Caespitosum, caespitibus depressis, superne viridibus, inferne decoloratis. *Caulis* ad 3 cm. circa longus, ramosus, repens, ramis 5–8 mm. longis, complanatis, cum foliis 2 mm. latis. *Folia* tam sicca quam madida patentia, e basi contracta elliptico-lingulata, breviter acuminata, praecipue ex uno latere curvata, 1·73 mm. longa, 0·48 mm. lata, marginibus integris, tantum in acumine parietibus cellularum prominentibus subtiliter denticulatis. *Costa* tenuis, inferne ad basin 30 μ lata, ad medium folii vel paulo ultra evanida. *Cellulae* basilares, lucidae, rectangulae, 20 × 10 μ ; cellulae mediae prosenchymaticae, parietibus tenuibus, 50 × 7–8 μ ; apicales rhombeae 30 × 7–8 μ, omnes laevissimae. *Folia perichaetialia* minora, erecta e basi amplectente



A–E, *Heterophyllium scabrifolium* J. Tayl. et P. de la V. A, leaf (× 58) ; B, cells at one-third from apex of leaf (× 453) ; C, cells from leaf apex (× 453) ; D, capsule (× 17) ; E, tooth from outer peristome (× 58).

F–H, *Dicranodontium tanganyikae* J. Tayl. et P. de la V. ; F, leaf (× 17) ; G, cells at one-third from apex of leaf (× 453) ; H, cells from margin of leaf (× 453).

anguste acuminata, integra, enervia. *Seta* rubescens, 10–12 (raro 15) mm. alta. *Theca* erecta, interdum obliqua, cylindrica, deoperculata 2·75–3 mm. longa, 0·60 mm. lata, sub ore haud constricta. Cellulae exothecii irregulariter quadrangulae vel hexagoniae, elongatae, circa 50–60 × 25–30 μ. Exostomii dentes ochracei, dense striati et trabeculati, superne papillati. Endostomii processus hyalini, carinati, integri, pappilati. Caetera iquirenda.

Figs. A.–F. (p. 514).

Ethiopia ; Sessaganno ridge, in evergreen forest being partly cleared for *Musa ensete* and coffee cultivation. 1,850–2,250 m. 19.I.1953. *J. B. Gillett* 14843 typus (Herb. Kew.).

The capsule is allied to that of *S. rufescens* Broth. from the Usambaras. In this species however it is only 1·5 mm. long with a maximum seta length of 8 mm.

Stereophyllum nitens *Mitt.*, M. Hb. Hook., 51 (1860).

French Guinea ; Dyeke, on tree. 11.X.1947. *J. T. Baldwin* Jr. 9657.

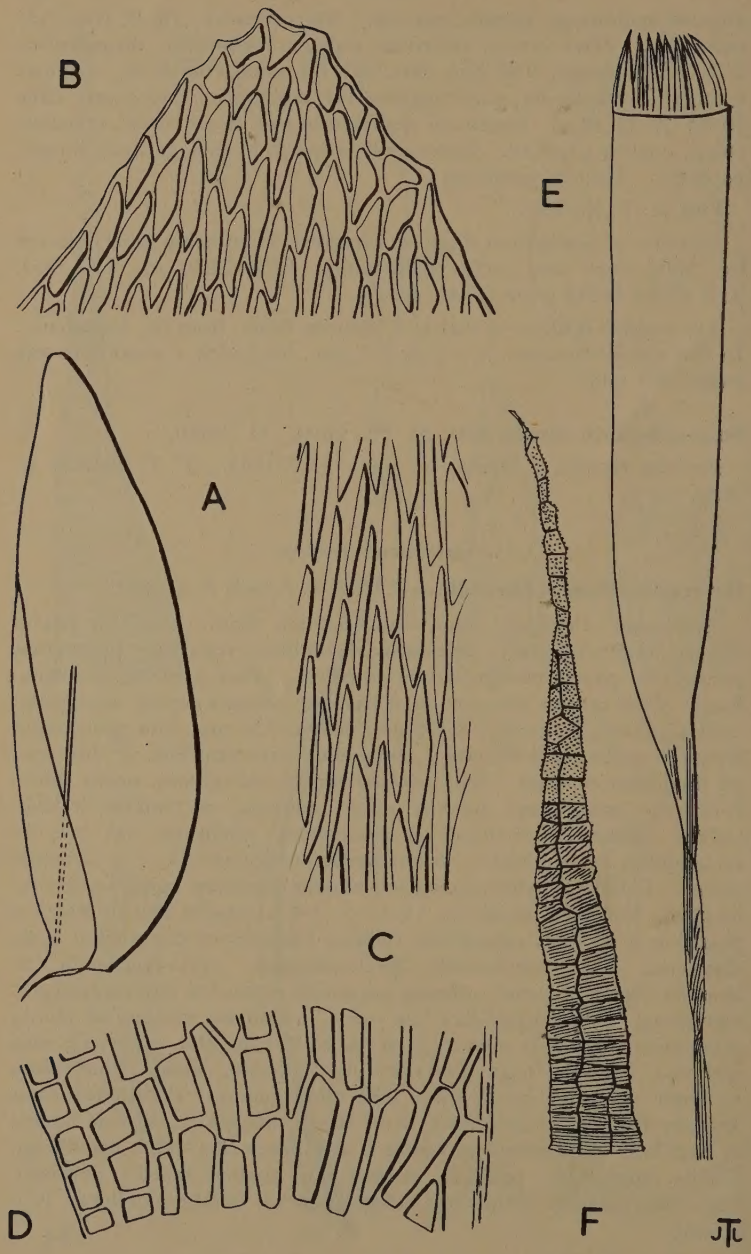
Sematophyllaceae

Heterophyllium scabrifolium *J. Tayl.* et *P. de la V.* sp. nov.

Autoicum. Caespites densi, lutei, paulum nitidi. *Caulis* prostratus 3–5 cm. longus, inferne ± denudatus, rhizoideus, irregulariter bipinnatus, paraphyllis paucis triangularibus praeditus. *Rami* patentes, 5–8 mm. longi. *Folia* caulina decurrentia, e basi late obovata raptim acuminata, mollia, plicata, concava, 0·8–0·9 mm. longa, 0·55 mm. lata, marginibus erectis, e media parte dentatis ; costis binis, divergentibus, ± distinctis, ad dimidium evanidis. *Folia ramealia* similia sed minora, nervis minus conspicuis, marginibus superne magis dentatis, et tenuiter inflexis. *Cellulae* basilares auriculares et marginales, quadratae vel breviter rectangulae, 7–10 μ latae ; juxtacostales hexagoniae 25 × 5 μ, omnes laeves. Cellulae mediae similes sed angulis parietum apicalibus prominentes ; superiores densiores, 15–17 × 3–4 μ, papilla apicali distincta praeditae ; in foliis ramealibus cellulae basilares et marginales magis distinctae. *Folia perichaetialia* erecto-adpressa, ovato-lanceolata, in acumen subtile, filiforme, subintegrum sensim extenuata, enervia, integra, laevissima. *Folia perigonialia* e basi ovata, acuminata, marginibus planis, subdenticulatis. Seta purpurea, laevis, 20–22 mm. alta. *Theca* ovoidea inclinata, 1·5 mm. longa (sine operculo), 0·8 mm. crassa. Operculum conicum, acute rostratum, circa 0·83 mm. longum. Peristomii dentes anguste deltoidei, pallide lutei, dense striati, marginati, superne hyalini et papillati. Endostomii processus e membrana alta enati, aequilongi, pallide lutescentes, papillati, carinati, in carina anguste perforati. Cilia bina, angusta, aequilonga. *Sporae* virides, minute papillosae, 10 μ crassae.

Figs. A.–E. (p. 512).

Sierra Leone ; Bintumane Peak, north-east face. c. 5,400 feet. 9.I.1951. *T. S. Jones* 92 typus (Herb. Kew.).



Stereophyllum macrocarpum J. Tayl. and P. de la V.

A, leaf (× 58) ; B, cells from leaf-apex (× 453) ; C, cells at one-third from apex of leaf (× 453) ; D, alar cells (× 453) ; E, capsule (× 25) ; F, tooth from outer peristome (× 58).

A remarkable species with the habit of an *Acanthocladium*. Its affinities are with *Heterophyllum guineense* (Broth. et Par.) Broth. and *H. flexile* (R. et C.) Thér. et P. de la V. from which it is distinguishable by the less finely acuminate leaves, scabrous on both surfaces and the strong apical papillae.

Sematophyllum caespitosum (*Sw.*) *Mitt.*, Journ. Linn. Soc. London, Bot., **12,** 479 (1869).

Nigeria ; Sapoba, Agbadi village on *Brachystegia* 14.XI.1949. *R. W. J Keay* and *R. D. Meikle* L. D. 11.

Sierra Leone ; Njala on branches of a mango tree. 3.X.1949. *F. C. Deighton* 5172.

Hypnaceae

Hypnum cupressiforme *Hedw.*, Sp. Musc., 291 (1801).

Belgian Congo ; Keshero, near lake edge on old lava flow, 20.VII. 1951. *H. A. Osmaston* 1078.

Ectropothecium afro-molluscum (*C. Müll.*) *Broth.*, in Engl. Bot. Jahrb. **24,** 268 (1897).

Sierra Leone ; Kambui Hills, moss covering damp shady rocks 24.IV.1953. *D. Small* 903 p. p.

E. brachycladulum (*C. Müll.*) *Broth.*, in Engl. Bot. Jahrb. **24,** 269 (1897).

Tanganyika ; E. Usambaras, Derema, on rotting stump in the forest near Kwamkuyu Falls. 2,100 feet. 17.IV.1950. *Verdcourt* 159.

Polytrichaceae

Pogonatum aloides (*Hedw.*) *P. Beauv.*, Prod., 84 (1805).

Tanganyika ; Amani, on red soil bank by roadside, c. 3,000 feet 28.III.1950. *Verdcourt* 127.

Polytrichum commune *Hedw.* Sp. Musc., 88 (1801).

Tanganyika ; Wisu, c. 5,000 feet. 23.VIII.1951. *P. J. Greenway* 8647.

Nigeria ; Bamenda, Bafut-Ngemba, in soil pocket on outcrop of rock. 25.VII.1951. *S. Tamajong* F.H.I. 26900.

P. piliferum *Hedw.* Sp. Musc. 90 (1801).

Uganda ; Ruwenzori, Speke Glacier, c. 15,000 feet. 29.III.1948. *Joy Adamson* J. A. 28.

The authors wish to thank Mr. N. Y. Sandwith for checking the Latin descriptions.

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The Alpine Garden.*—The author of this little book tells us in his Foreword that about half of it is devoted to random reflections which have occurred to him during a period of some twenty years of interest in Alpine gardens.

The book is intended for those with little or no experience of alpines and will be found a useful guide to all who wish to grow these fascinating little plants, a selection of which are dealt with in an entertaining way. The 12 charming coloured illustrations are well chosen while the smaller black and white illustrations on the title-page and at the end of each chapter have been taken from Verlot's " *Les Plantes Alpines* ". *The Annals of Horticulture*, Robinson's *Alpine Flowers for Gardens*, and Thomson's *The Gardener's Assistant.*

H. S. Marshall.

* The Alpine Garden. By C. F. Walker. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1954. Pp. 93. Col. plates 12. Price 15/-.

NOTES ON SPHAGNA FROM UGANDA.

Jane Taylor and A. Thompson.

This contribution contains a list of *Sphagna* from Uganda. One species *Sphagnum ugandense* is described for the first time. Taxonomically the genus is a difficult one and a short discussion of the problems encountered in working out these determinations concludes the account.

The systematic arrangement follows Le Roy Andrews (1936) in the broad lines of classification.

Subgenus **LITOPHLOEA** (*Russ.*) *Andrews*

1. Section MALACOSPHAGNUM *C. Müll.*

Sphagnum pappeanum *C. Müll.*, Synops. Musc. Frond., 101 (1849).

Magahinga. Forming hummocks between *Pycreus* spp. 10,000 feet. IX-1952. *E. M. Lind* 4 ; in crater swamp. 11,200 feet. Sept., 1953. *E. M. Lind* 13 & 14.

2. Section ACISPHAGNUM *C. Müll.* emend. *Andrews*

B. Series Cuspidata *Schlieph.*

S. planifolium *C. Müll.*, Flora **45,** 415 (1887).

Kigezi District. Kachwekano farm. Locally dominant in swamp. 6400 feet. XII-1951. *J. W. Purseglove* P3737.

Kabale. Buhara swamp. Among *Cyperus* spp. 6000 feet. IX-1952. *E. M. Lind* 2.

Kisoro. Marius bog. In general *Sphagnum* cover. 6500 feet. IX-1952. *E. M. Lind* 6.

Nabugabo. Among burnt *Miscanthidium* bordering lake. 3700 feet. XI-1952. *E. M. Lind* 8.

Masaka District. S.W. of L. Nabugabo. Between grass and sedge tussocks c. 1140 m. 7-X-1953. *R. B. Drummond* & *J. H. Hemsley* 4668.

S. cuspidatum *Ehrh.* ex *Hoffm.* emend., Deuts. Fl. **2,** 22 (1796).

Magahinga. Schandel's Bog. In hollows on wet peat. 10,000 feet. IX-1953. *E. M. Lind* 3.

Kigezi District. Kisoro. Marius Bog. Forming hummocks between *Miscanthidium*. 6500 feet. IX-1952. *E. M. Lind* 5.

Magahinga. In crater swamp. 11,200 feet. IX-1953. *E. M. Lind* 15 and 17.

S. subsecundum *Nees*, *Sturm.* Deuts. Fl. Crypt., 17 (1819).

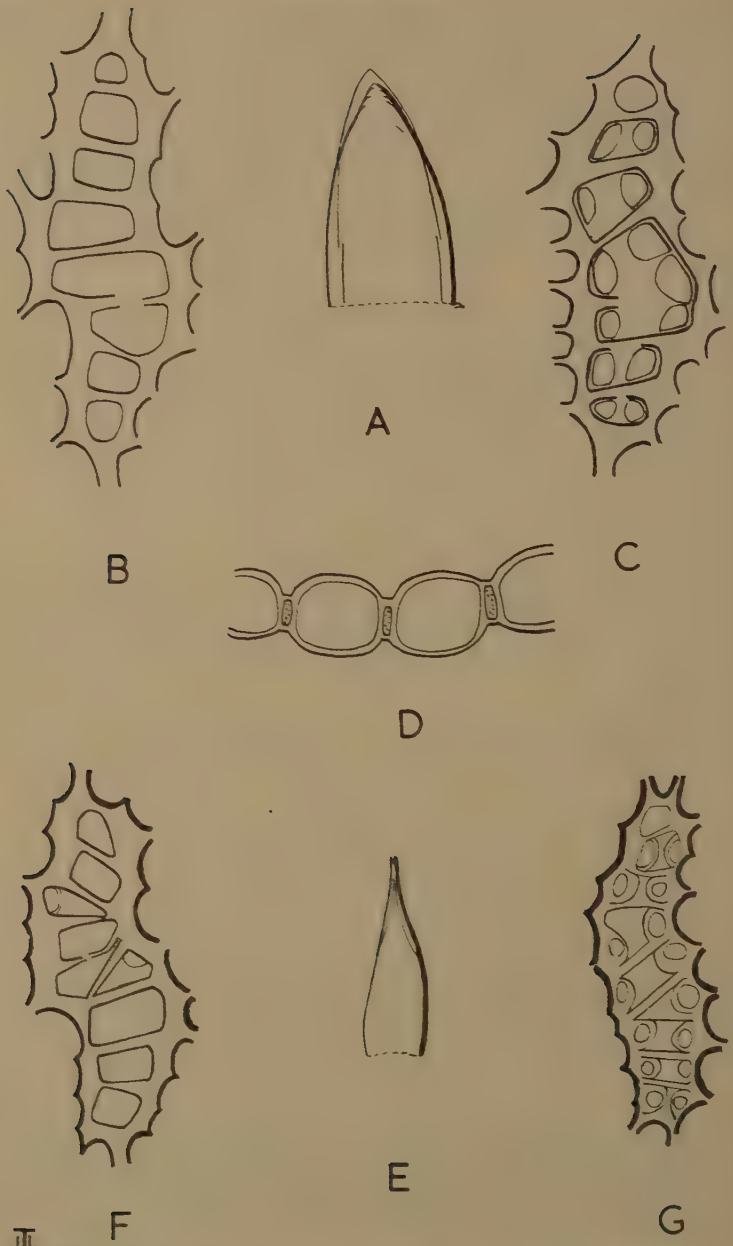
S. rehmanni Warnst., Hedw. **30,** 16 (1891).

L. Nabugabo. In pools on landward edge of *Miscanthidium* swamp 3700 feet. XI-1953. *E. M. Lind* 9.

C. Series Acutifolia *Schlieph.*

Sphagnum ugandense *J. Taylor* & *A. Thompson* sp. nov. [Subgenus **LITOPHLOEA** (*Russ.*) *Andrews* Sect. 2. ACISPHAGNUM *C. Müll.* emend. *Andrews* Series C. Acutifolia *Schlieph.*, affine *S. russowii* Warnst.]

Habitu *S. capillaceo* simile, flavo-fuscescens. Epidermis caulina e stratis 2–3 composita, a cylindro lignoso distincte diversa. *Folia caulina* triangulari-lingulata vel lingulata, magna 2·3–2·6 mm. longa, 1·2–1·5 mm. lata, superne fibrosa, apice rotundato lacerato ; limbus deorsum aut dilatatus aut indistincte dilatatus. *Folia ramulina* lanceolata 1·6



Sphagnum ugandense *J. Taylor* and *A. Thompson*. A, stem-leaf (× 18); B, hyaline cell from concave side of stem-leaf and C from convex side (× 453); D, transverse section of branch-leaf showing the chlorophyllose cells (× 453); E, branch-leaf (× 18); F, hyaline cell from concave side of branch-leaf and G from convex side (× 453).

2·0 mm. longa, 0·5–0·8 mm. lata, apice truncato dentato, anguste limbata integerrima multifibrosa, superficie dorsali poris multis magnis rotundis secus commissuras instructa, interiore lacunis paucis tantum praedita. Cellulae chlorophylliferae sectione transversali vel rectangulares vel paucae orciformes, utroque latere folii liberae.

Uganda. Kigezi District : Magahinga, in crater swamp, c. 3650 m., September 1953, *E. M. Lind* 12 typus (in Herb. Kew).

(P. 518, Figs. A.–G.).

Plants slender pale yellow or rust red. Wood cylinder red brown. *Stem* and *stem leaves*. Cortical cells of the stem in 2–3 layers, large, without fibrils, the outer cells rectangular much longer than broad, mostly with a single round pore at the upper end ; stem leaves large 2·3–2·6 mm. long 1·2–1·5 mm. wide at base, triangular-lingulate to lingulate with rounded lacerate apex, border not much widened below, with pitted cell walls, hyaline cells rhomboidal 4–6 and 10–12 times as long as wide in the apical and basal parts respectively, rarely septate, fibrillose rather more than half way, the membrane resorbed on most of the concave side ; on convex side large unringed pores in rows on the commissures a few near the base in single rows but absent at the extreme base where there is some resorption. *Branch* and *branch leaves*. Branches in fascicles of 5, 2 spreading, their cortical cells in a single layer, without fibrils differentiated into short non-porose cells and long retort cells each terminating in a large round pore. Branch leaves 1·6–2·0 mm. long, 0·5–0·8 mm. at maximum width, narrowly ovate-lanceolate to lanceolate, involute above to a toothed apex, the border entire of two to three rows of narrow cells ; hyaline cells fibrillose, 4–6 and 6–8 times as long as wide towards apex and base respectively. On convex side fairly large round ringed pores on the commissures in complete rows nearly to the base, only a few thinnings on concave side ; chlorophyllose cells in transverse section narrowly rectangular, a few barrel shaped, both sides free.

Closest affinity is with *S. russowii* Warnst. but the above species may be separated on the following characters, the large stem leaves with border scarcely widened below, the branch leaves much narrower in proportion to their length and the pore distribution on both stem and branch leaves.

For the determination of species we must turn to Warnstorf's monograph in Engler's Pflanzenreich (1911). Here 342 spp. (some with a considerable number of varieties and forms) are recognized. It is now realized that the genus is a particularly plastic one in which phenotypic variation is easily induced by changing ecological conditions and that Warnstorf's total may be reduced to about one third of the number. In determining species from Uganda, an area for which there is as yet no regional catalogue, it is therefore necessary to examine ' allied species ' and decide how much ' lumping " is justified on the basis of herbarium studies alone before one can discover the name which best applies. For example we have named material which agrees well with Warnstorf's description of *S. rehmanni* as *S. subsecundum* Nees. Garside (1949) considers that Sim's (1926) emend. of *rehmanni* Warnst. and *S. truncatum* Hornsch. are growth forms of one species taken from a long interconnected series. Dr. Le Roy Andrews (in litt.) considers that most of Warnstorf's innumerable species of the *Subsecunda* group are only forms of a single

species. Until experimental evidence is available it seems advisable to accept the broader view of Le Roy Andrews.

A fascinating phenomenon which is revealed in this short list is that African species appear to be either quite independent of those of other continents or else to correspond so closely that one is justifiably uncertain whether they are conspecific or different taxa. We have here two examples—*S. pappeanum* and *S. planifolium* analogous to our British *S. strictum* and *S. recurvum* respectively. The following character scorings show the closeness of this relationship in the *pappeanum–strictum* complex

	pappeanum	*strictum*
A. Colour	bluish white-straw yellow–pink	bluish white—light green–straw yellow.
B. Stem		
wood cylinder	yellowish green	ditto
cortical cells	thin walled	,,
no. of layers in cortex	1–3	,,
pores + or —	inner walls of cells with small pores	not observed
C. Stem leaves		
size	0·7–0·9 mm. × 0·7 mm.	0·45–0·6 mm. × 0·6–0·65 mm.
shape	triangular to lingulate–triangular but more pointed and often cucullate	triangular to lingulate–triangular
border + or —	bordered	ditto
hyaline cells divided or not	sometimes divided	not divided
fibrils + or —	fibrillose towards apex	mostly without fibrils
pores + or —	sometimes porose on inner surface	pores not observed
D. Branching	fascicles of 5, 2 spreading	ditto
E. Branch leaves shape	ovate–lanceolate squarrose	ovate–lanceolate to lanceolate squarrose
Pore distribution	inner pores in threes where cell corners are in contact, opposite each other, towards the leaf base in twos, more numerous near the lateral margins.	inner surface with strongly ringed pores in the corner of the cells, in pairs or threes at adjacent angles, 2–4 per cell. Outer surface with pores on the commissures 5–15 per cell.

	pappeanum	*strictum*
chlorophyllose cells in T.S.	enclosed on the inner surface of the leaf and exposed with a thick wall on the outer surface—delicately papillose where hyaline cells overlap.	ditto
F. Perichaetica leaves	broadly ovate, involute with hyaline cells fibrillose towards apex.	ovate-lanceolate with hyaline cells fibrillose towards apex.
G. Spores		
colour	yellow	ditto
smooth or rough	smooth	smooth or granular roughened
size	30–37μ	34–45μ

S. strictum Sull. is an American species with an " Atlantic " distribution in Britain and western Europe yet it is obvious that the only character on which these two species can be separated is the shape and size of the stem leaf.

One further feature of much interest is the determination of several gatherings as *S. cuspidatum*. Potier de la Varde (1936) has commented as follows " D'aprés Naveau (in litt.) **S. planifolium** remplace en Afrique equatoriale et tropicale le **S. cuspidatum** d'Europe et est aussi variable que lui ". This suggests that *S. cuspidatum* is not to be anticipated in Africa. However there is no character in these gatherings which is inconsistent with such a determination but in view of the *planifolium-recurvum* relationship it may be significant that *S. cuspidatum* comes dangerously near to being an aquatic form of *S. recurvum*. If experimental methods should one day prove this then *planifolium* might well produce aquatic forms similar to or identical with *S. cuspidatum* ! For the further elucidation of these problems one must look to field observations and experimental evidence.

The authors wish to thank Mr. N. Y. Sandwith for assistance with the Latin diagnosis and Dr. A. Le Roy Andrews for helpful criticism.

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NOTES ON CYPERACEAE : XXXII*.

E. Nelmes

Two Confused Species of *Hypolytrum*.

The main purpose of this note is to publish a new species of *Hypolytrum*, its description being extracted from a revision of African species of the genus, which is in course of preparation. The reason for publishing this species in advance of the revision is to provide a name for specimens of a *Hypolytrum* collected on the Island of S. Tomé, which are immature but which seem to belong to my new species. Their identification is needed for a " Supplement ", shortly to be published, to a " Catalogue of the Vascular Plants of S. Tomé ", 1944, by A. W. Exell.

This seems an appropriate occasion to clear up a long-standing confusion between the above-mentioned new species and *Hypolytrum africanum* Nees. I suspected that C. B. Clarke (Dyer, Fl. Trop. Afr. 8 : 488–489 : 1902) transposed these two species, regarding my new one as *H. africanum* and redescribing this latter species as *H. longiscaposum*. This suspicion was confirmed by an examination of what, in the light of annotations by Nees and other evidence, may be accepted as type material of *H. africanum*, collected by G. Don in Sierra Leone and preserved in Herb. Lindley at Cambridge. This is undoubtedly Clarke's *H. longiscaposum*. The principal distinguishing characters of the two species are given below.

Hypolytrum heteromorphum *Nelmes*, sp. nov. ; a *H. africano* Nees spicis cylindricis, achaeniis ovatis vel ellipticis majoribus distinguenda.—Type : Tanganyika, *Watkins* 526.

Spikes slenderly cylindric in flower, becoming more stoutly cylindric or lanceoloid in fruit, 5–23 mm. long. *Achenes* ovate to elliptic, 2–3 mm. long, 1·2–1·5 mm. broad.

French Guinea, Sierra Leone, Liberia, Ivory Coast, Gold Coast, Nigeria, French Cameroons, Gabon, S. Tomé, Cabinda, Belgian Congo, Uganda, Tanganyika.

Hypolytrum africanum *Nees* in Steud., Syn. Pl. Glum. II. Cyper. (1855).—Type : Sierra Leone, *G. Don*.

Hypolytrum longiscaposum C. B. Clarke in Dyer, Fl. Trop. Afr. 8 : 489 (1902).—Type : Sierra Leone, *Scott Elliot* 5050.

Spikes ellipsoid or obovoid in flower, usually subglobose but sometimes ovoid or obovoid in fruit, 4–6 mm. long. *Achenes* mostly oblong-obovate, about 2 mm. long and 1 mm. broad.

French Guinea, Sierra Leone, Liberia, Nigeria.

*Continued from Kew Bull. 1953, 381 (1953).

RECENT WORK ON THE SYSTEMATIC ANATOMY OF THE MONOCOTYLEDONS (with special reference to investigations at the Jodrell Laboratory at Kew).

C. R. Metcalfe.

Introduction

After the publication in 1950, of the 2 volumes by Metcalfe and Chalk entitled 'Anatomy of the Dicotyledons', it was felt that a reference book dealing with the anatomy of the Monocotyledons was badly needed. Research, which it is hoped will ultimately lead to the publication of a work of reference on this subject, is now one of the most important tasks on which the staff of the Jodrell Laboratory are engaged. Before embarking on this great undertaking, the matter was discussed by correspondence with Dr. F. J. Meyer, who, from 1928–1933, was, in collaboration with the late Professor Solereder, producing, in parts, a reference work entitled 'Systematische Anatomie der Monokotylen'. Dr. Meyer informed me, however, that owing to various difficulties, including those of publication, he would be unable to finish the work. Although nobody, apart from Solereder and Meyer, has attempted to make a comprehensive survey of the anatomy of the Monocotyledons, numerous accounts of investigations dealing with restricted groups of Monocotyledons have been published, particularly by French and German investigators at the end of the last and at the beginning of the present century. More recently the investigations by Cheadle and his colleagues in the U.S.A. concerning the structure of Monocotyledons in relation to their phylogeny has aroused fresh interest, and studies by agrostologists, particularly those by Prat, have reemphasised the importance of comparative anatomy in the taxonomy of the Gramineae. Professor Kaul in India has for many years been engaged in studying the structure of palm trunks in relation to their classification; and he has secured most interesting results which are as yet not widely known because they remain unpublished. Our first task in preparing a book on the comparative anatomy of the Monocotyledons was to index the great wealth of anatomical literature, scattered as it is in many different journals, on a taxonomic basis. This has now largely been done thanks to the valuable assistance of Miss E. Slatter, working at Kew, where she prepared a most important card index to the literature. This index is proving invaluable not only for our own researches, but to botanists outside Kew who have wanted to know what literature there is dealing with the anatomy of the plants in which they are specially interested.

Aims and Objects in Preparing the Proposed Book of Reference

It is impossible in the span of human life for any one person to produce an all embracing book on a group so large as the Monocotyledons. The most at which one can aim is a general survey based on a summary of existing literature supplemented by original observations on as wide a range of material as circumstances permit. The main objects one has in mind is to prepare a book that will serve the following purposes :—

(1). Be a dictionary which enables the reader quickly to learn what is known about the structure of any particular plant, and, by reference

to the literature, to follow up any particular aspect of plant structure in which he is interested, e.g. developmental or ecological anatomy.

(2). To serve as an aid in identifying economic plant products derived from Monocotyledons, e.g. fibres.

(3). To improve existing systems for the classification of Monocotyledons, and to throw light on their phylogeny.

Although no precise details have yet been fixed, arrangements are being made with the Clarendon Press at Oxford to publish a book on the lines indicated. It has been agreed in principle that the book will appear in parts, of which one will be devoted to the Gramineae.

Methods of Work

(a) *Collecting Material.* From the standpoint of the herbarium taxonomist it would doubtless be best to base all investigations on herbarium specimens, as this would enable the authenticity of the material to be checked. On the other hand the disorganization and distortion of tissues that occur in herbarium specimens are a nightmare to the anatomist. There is a definite risk that inaccuracy of anatomical observations may cause just as much harm as inaccurate identification if one relies solely on herbarium specimens. Nevertheless herbarium material can sometimes be revived by treating sections with such homely reagents as bleaching agents of the " Parazone " type which have a marked capacity for causing collapsed cells to revert to their original sizes and shapes.

Nevertheless one can secure much better results by working with materials fixed and preserved in formalin acetic alcohol until required for use. Material grown at Kew is constantly being collected and preserved for our anatomical studies, and supplementary material has kindly been supplied by collaborators in other countries such as Australia, Tasmania, Singapore and parts of Africa. Many more Monocotyledons from S. Africa are still required, and others, especially from S. America are still badly needed. (See Metcalfe in Taxon I : 8 ; 127–32 ; 1952).

(b) *Selection of Material.* Since it is impossible to examine every species it is necessary to make some selection. Here one must be guided by the material that circumstances enable one to obtain, by the nature of the plants, and the number of species in each genus. From the taxonomic standpoint it is preferable at this early stage to lay emphasis on the genus rather than on the species, care being taken to ensure that genera from as many tribes as possible are included. With the Gramineae for example no attempt has been made to examine numerous species of *Festuca* or *Poa*, but I have tried rather to examine a few species of the most important genera from a wide range of tribes.

(c) *Cutting Sections.* Since there are so many plants to examine, all techniques must be as simple as possible. Fortunately serial sections are seldom required, so that it is not often necessary to embed material in paraffin wax. Sections of most material can be cut on a sledge microtome without previous embedding, but, if necessary, thin stems and portions of leaves can be clamped into the microtome carrier between

pieces of cork or pith. Where material is still more delicate, or contains a well developed system of intercellular spaces, it may be rapidly embedded in wax that is soluble in water, or in agar, and then cut on a sledge microtome with a freezing attachment. Miss M. Stant has secured good results by these methods with the Alismataceae. Epidermal preparations of grass leaves and similar material can be made by scraping away one epidermis and the underlying mesophyll with a safety razor blade, after which the remaining epidermis can be mounted and examined. Staining is usually by haematoxylin and safranin, and a permanent mountant such as canada balsam is necessary.

(d) *Filing Slides.* Slides can be filed for reference most easily in aluminium holders made to fit into an ordinary card index cabinet. After experimenting with several alternatives, it has been found most convenient to file the slides by families, but to arrange the families, and the genera and species in each of them, in alphabetical sequence.

(e) *Recording Information.* As mentioned above a useful card index to the literature already exists at Kew. It is now possible to look up references to any particular family and, for the Gramineae, the literature index has been extended to cover genera and special subjects. The whole index is on cards measuring 15 cm. × 10 cm., and abstracts of the various papers are being written or attached to the appropriate cards.

Information obtained by examining the slides in our reference collection is being recorded on perforated index cards, where each perforation is numbered. Each number corresponds to a character of diagnostic value, the nature of which is more precisely defined by reference to a standard illustration bearing the same number as the perforation to which it corresponds. A separate card is prepared for each species, and, where more than one lot of material of any one species is examined, a separate card is filled in for each lot. The diagnostic characters are recorded by converting the appropriate perforations to slots by means of a special pair of clippers. Whenever desirable, supplementary comments or notes can be made on the cards. This method of recording information is scarcely worth adopting for small taxonomic groups, but it is very useful for large or complex taxa such as the Gramineae. Grasses that exhibit any particular diagnostic character can at once be picked out from a pack of cards by inserting a metal rod into the appropriate hole and shaking the pack, when the cards corresponding to the grasses that exhibit the character in question, will at once fall out. The perforated card system just described is a modification of one that was devised at the Forest Products Research Laboratory at Princes Risborough, England, some years ago for the identification of timbers and which has been found to work very effectively.

Progress of the Work at Kew

I *Gramineae*

My own work during the last few years has been concerned with the comparative anatomy of the Gramineae. It would have been impossible to investigate this notoriously difficult family without the helpful collaboration of my two colleagues Mr. C. E. Hubbard and Dr. N. L. Bor, who

have confirmed the identity of all of the material on which the investigation rests. It would be possible to continue working on the Gramineae alone for the remainder of one's life without exhausting them, but, as the intention is to deal with the Monocotyledons as a whole, a halt must now be called, and the results made available as soon as circumstances permit.

1. *Diagnostic Characters*

The investigation has shown that it is necessary to draw a clear distinction between diagnostic characters that are significant in the basic classification of the Gramineae on the one hand, and those, on the other, that are significant only in the identification of species after the genus has been determined. For convenience we may divide both the basic characters and those of specific diagnostic value into 2 categories ; (1) those that are to be seen in transverse sections of the lamina and (2) those that can be more readily observed in preparations showing the leaf epidermis in surface view. The following characters include those that have been found to be the most valuable for diagnostic purposes.

A *Basic diagnostic characters.*

(i) *Visible in transverse sections of the lamina.*

(a) Number and arrangement of the vascular bundles in the keel.

(b) Occurrence shape and distribution of the bulliform cells.

(c) Occurrence of single or double sheaths around the vascular bundles.

(d) Extent to which the assimilatory cells are arranged in a radiate manner around the vascular bundles.

(e) Structure of the xylem in the vascular bundles.

(ii) *Visible in epidermal preparations.*

(a) Silica- and cork- cells over the veins solitary, paired, in rows of 3–5 cells or in rows of more than 5 cells.

(b) Shape of subsidiary cells to stomata triangular, straight-sided, hemicentric or tall hemicentric.

(c) The presence or absence of micro-hairs (Winkelhaare) which are usually, but not invariably, 2-celled. The shapes of these hairs is of more restricted diagnostic value because their distal cells, which are generally very thin-walled, become distorted or collapse very readily.

(d) The shapes of the silica bodies in the silica cells over the veins. More types exist than appear to have been generally recognized by some of the previous investigators.

All of the above characters are individually important, but pairs or larger combinations of characters that occur together are still more significant, e.g. It is common to find that when cross-shaped silica bodies occur above the veins, the stomata in the same grasses have triangular subsidiary cells. On the other hand stomata with triangular subsidiary cells are not invariably accompanied by cross-shaped silica bodies.

B. *Specific Diagnostic Characters.*

(i) *Visible in transverse sections of the lamina.*

(a) Occurrence and distribution of sclerenchyma, especially in relation to the vascular bundles.

(b) Extent to which the adaxial surface is provided with ridges and furrows.

(c) Shape of the outline of the lamina in transverse sections. This applies particularly to certain genera such as *Festuca*.

(ii) *Visible in epidermal preparations.*

(a) Occurrence and distribution of large hooks (aiguillons) or small rounded hooks (crochets).

(b) Occurrence, distribution and types of epidermal papillae.

(c) Occurrence and distribution of 1-celled hairs.

2 *Conclusions concerning the Gramineae.*

The work at Kew confirms, in the main, that the classical work by Pée-Laby, Grob and other well known workers on grass anatomy is sound. This applies also to the far more recent work such as that by Henri Prat whose contribution to the subject is of major importance. It is clear, however, that some of the minute details to which the early workers ascribed great importance now appear to be less significant when so many more grasses from countries outside Europe have been examined. Furthermore it is evident that there is more variation in certain structures than was at one time supposed, so that some of the descriptive terms in former use require more precise definition. For example silica cells that were at one time collectively classified as dumbbell-shaped and saddle-shaped respectively are in fact more variable than these 2 comprehensive terms imply. Then again the classical workers did not, as now seems desirable, clearly distinguish between diagnostic characters of basic and specific diagnostic value respectively. The occurrence of similar specific diagnostic characters in grasses that are not in fact closely related, indicates that parallelisms in grass evolution must have occurred. For example a transverse section of a leaf of *Stipa hookeri* Stapf is in many ways similar to that of *Ammophila arenaria* (L.) Link. It may well be that this resemblance is due to the fact that both species show a type of structure that has arisen in response to the xerophytic conditions in which they grow.

Several major taxonomic groups within the Gramineae stand apart from each other rather clearly on the basis of anatomical characters, e.g. the Bambuseae, the tropical grasses included broadly in the Andropogoneae and the Maydeae, and the Chlorideae. There is, however, some overlap in the characters exhibited by certain members of some of these groups, particularly in the Andropogoneae and Maydeae. The Oryzeae form a distinct group ; members of the Eragrosteae are in some ways distinctive ; and the Isachneae appear to be a rather isolated group. The grasses of temperate regions mostly exhibit characters that seem to distinguish them from tropical grasses. It might perhaps be

thought that this fact does no more than reflect the different ecological conditions in which the plants grow. On the other hand the fact that grasses with different types of structure can and do occur together, both in tropical and temperate regions, shows that hereditary anatomical characters are more firmly established than is sometimes realized. Even when unrelated grasses resemble each other because of ecological specializations in structure, there are generally found to be hereditary or taxonomic differences which reveal their true affinities. The complex nature of the problems that these considerations raise in one's mind show how necessary it is to be cautious in interpreting plant structures as taxonomic or hereditary. Returning to the grasses of temperate regions it may be noted for example that *Nardus* and *Molinia* differ so much from most European grasses that their taxonomic affinities appear to lie elsewhere. *Calamovilfa* exhibits many of the anatomical characters of the Eragrosteae. The long-stalked, glandular hairs of *Enneapogon*, and the shorter and wider 2-celled glands that occur in pits in the leaf surface of *Neostapfia* appear to be distinctive for the genera in which they occur. The species of certain genera fall into 2 or more distinct groups. This applies for example in *Aristida* which includes groups of species each with a different type of silica cell. It can readily be seen with the aid of the perforated index cards mentioned above that, on anatomical grounds alone, there are many genera that are not sharply differentiated from their close allies. The characters of the individual species comprising these interlocking genera overlap to such an extent that the genera themselves can be pictured more accurately as forming a meshwork than a series of separate compartments. This concept of a mosaic or meshwork of taxonomic units is becoming increasingly familiar as a result of other recent developments in systematic botany. The examples just cited are but a few of the numerous points of interest that are emerging as the work on the Gramineae proceeds.

II *Alismataceae*

Dr. Margaret Stant's work on the Alismataceae, which is at present incomplete, has shown that the structure of this group is very uniform. As would be expected, the aquatic or marsh-inhabitating plants of which the family is composed exhibit well-developed systems of intercellular spaces, much of the ground tissue consisting of a meshwork of uniseriate strands of parenchyma, with intercellular spaces between them. In the more solid structures such as leaf midribs, petioles and roots, the intercellular system is interrupted at intervals by porous, transverse diaphragms with vascular strands embedded in them. Longitudinal secretory ducts, lined with epithelium, and which are sometimes referred to in the literature as 'latex canals' despite their having no visible contents, occur in the aerial parts of all of the species that have been examined. Stomata are of a uniform type, each being accompanied on either side by a subsidiary cell parallel to the pore, and by an additional subsidiary cell at right angles to the first two at either end of the stoma. In the leaf, the lamina is dorsiventral, with a single layer of palisade cells, and the petiole is triangular in transverse section. The midrib is pronounced, and, in transverse sections of species with large leaves, exhibits a vertical row of 2–3 vascular bundles of which all but the one nearest the adaxial

surface are normally orientated, having adaxial xylem. In species with smaller leaves the vascular and intercellular systems are somewhat reduced. Transverse sections of the petiole of species with large leaves exhibit 1 large central and 2 lateral vascular bundles accompanied by other smaller peripheral strands.

One of the most important facts is that vessels are confined to the root xylem, the tracheal elements in the rest of the plant consisting of tracheids. The metaxylem elements exhibit close scalariform thickenings. These facts are important because the Ranunculaceae, which have often been pictured as being allied to the Alismataceae, have vessels throughout the plant, and the vascular bundles are of a rather different type from those in the Alismataceae. These observations are in line with those previously made by Cheadle, and support his view that vessels arose independently in the Monocotyledons and Dicotyledons respectively and that the Ranunculaceae and Alismataceae are less closely related than has sometimes been assumed.

The significance of Dr. Stant's work will become more apparent when her studies have extended to the reputed allies of the Alismataceae.

III *Xanthorrhoeaceae*

The Xanthorrhoeaceae, a family of xerophytes from Australia, the most familiar members of which have a habit resembling that of arboreal grasses, was examined anatomically by Dr. A. Fahn of the Hebrew University at Jerusalem while working at the Jodrell Laboratory at Kew. The grass-like leaves exhibit structural features that are generally characteristic of xerophytes. These include an epidermis of thick-walled cells ; a thick cuticle extending over the guard cells as well as over the epidermal cells ; a compact photosynthetic tissue, and, in most species, colourless parenchyma in the mesophyll. An interesting and somewhat distinctive feature in *Xanthorrhoea*, *Baxteria* and *Kingia* is that the substomatal chambers are lined with sclerosed cells of sponge-like appearance, or by projections of the hypodermal sclerenchyma. Dr. Fahn examined material of every known species of the 8 genera of which the family is composed and showed that :—

(1) The species can be identified by the structure of the leaves as seen in T.S. (This will need verification on additional material, but apart from the possibility that minor modifications may become necessary, I believe Dr. Fahn's conclusions are basically sound).

(2) The dominant structure of the vascular bundles in the stem is amphivasal, except in *Kingia* where the vascular bundles have xylem that appears U-shaped in transverse section. The amphivasal type of bundle, in Dr. Fahn's opinion, probably arose by fusion of pairs of bundles with U-shaped xylem, evidence of this being provided by *Xanthorrhoea* itself.

(3) The anatomical facts indicate that Hutchinson was correct when he followed Dumortier by treating the Xanthorrhoeaceae as a separate family. Bentham and Hooker's treatment of the genera that now constitute the Xanthorrhoeaceae as if they were members of the

Juncaceae is not substantiated by anatomical evidence, nor is their inclusion in the Liliaceae as in the Engler system any more satisfactory. (4) Fahn found that vessels in most Xanthorrhoeaceae are confined to the roots, although he also observed them in the leaves of *Xanthorrhoea* and *Acanthocarpus*. The Xanthorrhoeaceae thus exhibit a less specialized level of vascular organization than those members of the Juncaceae previously examined by Cheadle who found vessels in the xylem throughout the plant. Most of the 43 species of Liliaceae which he examined were found by Cheadle to have vessels only in the roots, but here the perforation plates are scalariform. Fahn found simple perforations to the root vessels in 6 out of 8 genera of Xanthorrhoeaceae, scalariform plates being confined to the remaining 2. In the light of these facts, the Xanthorrhoeaceae appear to be more specialized than the Liliaceae. The vascular organization of Xanthorrhoeaceae is, in Fahn's opinion, at about the same level of specialization as that of Agavaceae.

IV *Tracheal Elements in Various Monocotyledons.*

Other work which Dr. Fahn completed whilst at Kew, concerned the occurrence and distribution of different types of tracheal elements in 19 species of 18 genera from 8 families of Monocotyledons that have not been previously examined, and of which material has been difficult to obtain. Owing to the difficulty of classifying certain tracheal elements that are intermediate between vessels and tracheids he has proposed the term " vessel tracheid ". This term is analogous to " fibre-tracheid ", which is in general use for elements intermediate in character between fibres and tracheids. The occurrence and distribution of the tracheal elements observed by Fahn is as follows :—

Taccaceae. Vessel-tracheids in roots ; tracheids in other organs.

Philydraceae, Lowiaceae, Velloziaceae } Vessels confined to roots.

Cyclanthaceae. Vessel-tracheids in roots and leaves ; only tracheids in rhizomes.

Philesiaceae. The nature of tracheal elements varies from species to species.

(a) Vessel-tracheids in roots ; tracheids in all other organs.

(b) Vessel-tracheids in roots and stems.

(c) Vessels with simple perforations in roots ; vessels with scalariform perforations in the stem ; vessel tracheids in the leaf.

Restionaceae. Vessels in roots, rhizomes and stems.

Flagellariaceae. Vessels with simple perforations or scalariform plates in stem and leaf.

These newly discovered facts confirm and extend the principles concerning tracheal evolution in the Monocotyledons previously laid down by Cheadle.

V *Zingiberaceae*

Mr. P. B. Tomlinson of Leeds University, whilst working at Kew examined a wider range of Zingiberaceae than has been studied by any previous worker. This investigation is still in progress. Tomlinson has, however, established that whilst the structure of the whole family is rather uniform, and has points in common with that of other families included in the Scitamineae, there are rather marked anatomical differences between the 2 subfamilies Costoideae and Zingiberoideae. It is difficult in a few words to describe the nature of these differences, but the following points are noteworthy. The Costoideae differ from the Zingiberoideae in the much greater development of adaxial hypoderm in the leaf, both with reference to the number of cell layers as well as to the size of the cells. In the midrib of *Costus* there is a principal adaxial arc of large vascular bundles accompanied by a single, small, median, abaxial bundle ; air spaces between the vascular bundles in the main arc are absent. In the Zingiberoideae, on the other hand, the vascular bundles are in 3 distinct arcs, the adaxial and abaxial arcs consisting of much smaller bundles than those of the main arc between them. Air spaces are present between the large bundles of the main arc. There are corresponding differences in the petiole and leaf sheath in members of the 2 subfamilies.

In the stem internodes of both the Costoideae and Zingiberoideae a fibrous layer separates the cortex from the central cylinder. The bundles in the central cylinder are continuous with those in the main arc of the leaf sheath, whereas the cortical bundles are continuous with those of the abaxial arc. The fibrous sheath in the Zingiberoideae is a regular cylinder, whereas the sheath in the Costoideae is sinuous in outline and the cortex narrow, the cortical bundles being in contact with the sheath. There are also differences in the courses of the bundles in the 2 groups.

Hairs of similar types occur throughout the family, but in *Costus*, unlike the Zingiberoideae, they are never sunken and often multicellular.

Oil cells with suberized wall lamellae are characteristic of the Zingiberoideae and absent from *Costus*.

Silica bodies, sometimes in the form of stegmata,* occur widely in the family, but whereas in the Zingiberoideae the silica bodies are spherical and with warty surfaces, those in *Costus* are stellate or druse-like.

It is interesting to note that the anatomical differences just mentioned are accompanied by exomorphic and floral differences, and that Prof. G. Erdtman has pointed out that the pollen of the Costoideae differs not only from the pollen of the Zingiberoideae but from that of the Scitaminaeae as a whole.

Mr. Tomlinson noted some parallelism between anatomical structure and the division of the Zingiberoideae into tribes. He also found that the occurrence and distribution of the sclerenchyma associated with the vascular bundles, and the number of rows of cortical bundles in the stem internodes, are characteristic of certain genera. *Hornstedtia* stands out

* Stegmata are longitudinal files of cells with a single silica body in each cell, one wall of each silica cell being adjacent to fibrous tissue.

from the other genera because lignified elements occur in the phloem itself, and *Globba* because large crystals are present in the adaxial hypodermis of the leaf.

General Conclusions

The study of the anatomical structure of the vegetative organs of the Monocotyledons reveals characters that are already recognized as important in the broad taxonomy of the group, and which may quite well come to be regarded as more significant when the antomy of the Monocotyledons is more completely known. The commonly held view that our existing knowledge is so complete that it is scarcely worth while to pursue the subject further, is far from correct. This will become more evident when the great number of Monocotyledons in the world that have not as yet had even a cursory examination come to be investigated. The student of the comparative anatomy of the Monocotyledons is at present in the position in which an herbarium botanist would find himself if he had to work in a very incompletely stocked herbarium where even those plants which it contained had been only imperfectly examined. In such circumstances we may easily draw conclusions that subsequent work will show to be incomplete, inconclusive, or even misleading. There should be no despair because of this. On the contrary the task before us should serve as a challenge to all those botanists who have the knowledge and facilities to pursue the subject. It seems probable that comparative studies will ultimately yield the reward not only of an improved classification, but also of a much more comprehensive understanding of the physiology and form of the flowering plants than we at present possess. The slow process of observing and recording facts will be long and tedious, and much of the work necessarily dull. No major synthesis of natural knowledge has, however, been achieved at any time without much toil and sweat. One feels that this effort is worth making, if only for the reason that it is a line of enquiry that will tend to focus several special lines of investigation on one point, and thus to prevent the disintegration of what we were once proud to call botany into a series of narrow fields in which a broad minded botanist might despair of ever finding his way.

Successful Begonia Culture.*—All those interested in Begonias will find much of value in this book written by the Founder President of the National Begonia Society.

The book opens with an historical account of the Begonia, while further chapters deal with Tuberous, Winter-flowering, Rhizomatous, and Fibrous rooted varieties, and give useful information on their cultivation and propagation, pests and diseases, exhibiting and hybridization. It is well illustrated with line drawings and photographs.

H. S. MARSHALL.

* Successful Begonia Culture. By Frederick Bedson. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1954. Pp. 84. 7 line drawings and 30 photographs. Price 15/-.

A NEW SPECIES OF KRAUSEOLA FROM NORTHERN KENYA.

W. B. Turrill

Krauseola gillettii *Turrill* sp. nov., a *K. mosambicina* (Moss) Pax & Hoffm. foliis acutis vel subobtusis, sepalis lanceolatis vel anguste ovatis vel lanceolato-ellipticis acute apiculatis, petalis rotundatis vel inconspicue dentatis differt.

Herba annua vel perennis (?), usque ad 1·7 dm. alta (in typo), ramosa. *Caules* erecti vel adscendentes ; internodia teretia, 1–2·4 cm. longa, plus minusve breviter hirsuta, pilis saepe ramosis pilis brevibus interdum interspersis. *Folia* opposita (vel pseudoverticillata), oblanceolata vel anguste oblanceolata, apice acuta vel subobtusa breviter apiculata, basi gradatim angustata sed haud vel vix petiolata, 8–32 mm. longa, 2–9 mm. lata, pagina utraque margine nervisque praecipue hirsuta pilis saepe ramosis vel glabrescentia pagina adaxiale praecipue, costa nervisque in pagina abaxiale prominentibus vel subprominentibus ; stipulae elongato-triangulares, gradatim acuminatae, 2–3 mm. longae, scariosae. *Cymae* 3–9-florae ; rhachides pedicellique breviter hirsuti ; pedicelli 2–5 mm. longi ; bracteae lanceolatae, acuminatae, 2–3·5 mm. longae, scariosae. *Sepala* circiter 9–11, spiralia, imbricata, ambitu lanceolata vel anguste ovata vel lanceolato-elliptica, acute apiculata, 3·5–5 mm. longa, 1·25–2·5 mm. lata, cochleiformia, margine late scariosa, 3–7-nervata. *Petala* 5–8, oblonga, apice rotundata vel obscure dentata, 1 mm. longa, tenuiter hyalino-membranacea, nervis (saepe solitariis sed furcatis) inconspicuis. *Stamina* fertilia 5–8, petalis alternis, glandulis brevissimis leviter emarginatis inter stamina instructa ; filamenta 1·5–1·75 mm. longa ; antherae vix 1 mm. longae. *Ovarium* late ovoideum, 2 mm. altum, 2 mm. diametro, ovulis numerosissimis praeditum ; stylus 1·5 mm. longus (ramis stigmatosis 5 inclusis). *Capsula* 5-valvata, late ovoidea, 6 mm. alta, 5 mm. diametro. *Semina* reniformia, 0·75 mm. lata, nitida.

Kenya. Northern Province, Sololo Police Post, 810 m., worn grass near Post, 2.8.1952, *J. B. Gillett* 13676. Probably perennial, perianth green with scarious margins. Holotype in Herb. Kew. The following locality and habitat notes are provided by the collector : Sololo, 3°34′N. × 38°38′ E. Alt. 740 m. A plain with alternating red sandy loam, yellow-grey and black cotton soils and outlying mountains of the escarpment (red igneous rocks) rising to 1350 m. Rainfall rising rapidly from S.–N. (probably from c.400 – c.800 mm.). Vegetation on plains, *Commiphora-Acacia* scrub ; on mountain *Acacia pennata*, *Dicrostachys*, *Combretum*, *Ficus*, etc. ; on higher mountain, *Dracaena* and *Coleus*.

Placed by the writer in the same species are two sheets at Kew, of the same collector, with the following data on the labels : Dandu, Northern Prov., Kenya, alt. 866 m., red sandy loam, 1.5.1952, *J. B. Gillett* 12995. Annual, i.e. flowering in the first year : most probably perennating as well. Locality and habitat data given are : Dandu, 3°26′N. × 39°54′E. Alt. 750 m., with mountain rising to 1100 m. Rainfall perhaps between 300 and 400 mm. with maxima in April and probably November. In 1952 the main rains started on 27th March. Rock red granite ; soils :— (a) a red sandy loam on well drained slopes, (b) pale sandy soil near water-courses, (c) a yellowish brown powdery soil on flats, (d) ‘ black

cotton soil ', glutinous, cracking in areas of impeded drainage. A rich *Commiphora–Acacia* scrub with scattered larger trees such as *Delonix*, *Terminalia*, *Gyrocarpus*.

The generic name *Krauseola* was proposed by Pax and Hoffmann (in Pflanzenfam. **16c.** ed. 2, 308 : 1934) to replace *Pleiosepalum* Moss, published in Journ. Bot. **69,** 65, t. 596 (1931), the latter name being antedated by *Pleiosepalum* Hand.-Mazz. There is no doubt that *Krauseola gillettii* is structurally very closely related to *K. mosambicina*. There are, however, a number of small morphological differences involving habit, leaves, and shape of sepals and petals. These, combined with the wide gap between the known ranges (the extreme north of Kenya and Delagoa Bay), seem sufficient to distinguish the two sets of specimens specifically.

The excellent material (two collectings) of Gillett lend support to Moss's interpretation of the flower structure. The suggestion by Pax and Hoffmann that the sepal-like organs are to be considered as belonging to two distinct categories, the five innermost as " tepals " and the remainder as involucral bracts, is untenable. Rarely, the two outermost organs of the flower appear to be more or less opposite, but the rest, and most often all, are arranged in a spiral that cannot be divided. There is nothing approaching the distinction between calycine bracts and calyx seen, for example, in species of *Dianthus*. This is the position for descriptive purposes and is independent of any hypothesis regarding the origin of sepals in phylogeny. Similarly the term " petala " is used independently of their possible ancestral origin from stamens or staminodes. The leaves are strictly opposite and decussate. What at a casual glance, appear to be whorls are due to the early development of the lowest leaves of axillary shoots.

The additional sheets (*Gillett* 12995) are definitely considered conspecific with the holotype. In a few respects they permit a more extended description to be made. The following measurements exceed the range of those taken from *Gillett* 13676 : stems up to 2·7 dm. tall ; leaves up to 4·7 cm. long and 1·3 cm. broad. The structure at the junction of stems and root strongly suggests that, given suitable environmental conditions, the plants behave as perennials. The degree of development of indumentum on the stems and leaves varies.

Amateur Gardening Annual, 1955.*—This well produced publication contains a series of articles of general horticultural interest, edited by A. G. L. Hellyer, F.L.S. Titles range from such as are eminently practical, as " Designing and Building a Rock Garden ", to specialized accounts of individual genera, as *Iris*, or species, as the sweet pea. Flower gardening, vegetable growing, and fruit raising are all included, though the first is numerically predominant. " Work in the Garden " is dealt with for every month. Most of the illustrations are of a high standard and are excellently reproduced.

* Amateur Gardening Annual, 1955 (1954). " Amateur Gardening ", Tavistock Street, Covent Garden, London, W.C. . pp. 132. 5/-.

ON THE IDENTITY OF TWO SPECIES OF EUCHEUMA FROM THE INDIAN OCEAN.

Carola I. Dickinson

There has been, for some years, a growing interest in marine algae as industrial raw material, an interest which is centred mainly around the group of large brown seaweeds yielding alginic acid convertible to alginates, which have a wide range of applications now fairly well known to both botanist and chemist. Alginate production has to some extent overshadowed the older industry of agar manufacture. The name " Agar-agar " was first used in the far east where species of *Eucheuma* in the dried state were known as such to the Malaysians. The term is now used for a number of colloidal extracts with slightly differing properties, obtained from a variety of red algae, particularly from species of *Gelidium* and *Gracilaria*. *Eucheuma* has been superceded as a source of agar largely on account of the abundance of other agarophytes which will form gels in weaker concentrations. Since its introduction as a culture medium for bacteria, agar has remained an indispensable item in Materia Medica; moreover as a general purpose substitute for gelatine it has the great advantage of having a higher melting point.

This enquiry into the genus *Eucheuma* was made necessary because of the difficulty in dealing with specimens which come in to Kew for identification, and it was further stimulated by the recent arrival of very fine samples of two distinct species collected in the neighbourhood of Zanzibar.

Eucheuma contains some 34 species, more or less, according to ones interpretation, and is one of a number of genera which present considerable difficulties to the algal taxonomist ; the species are frequently ill defined, and many of them have been described from material which by present day standards would be considered totally inadequate. It therefore seems desirable when good specimens are available, to describe them as fully as possible with a view to a revision of the genus when there is sufficient accumulation of data. The only critical review of the genus is that contained in " Algues du Siboga " written by Mme. Weber van Bosse and published in 1928. I am grateful to the Director of the Rijksherbarium, Leiden, for the loan of material on which her observations were made and also to Dr. Josephine Koster who has responded generously to any requests for information.

Eucheuma inhabits tropical and subtropical waters, most of the species occurring between the 30° parallels on either side of the equator. It appears from printed and herbarium records that the plants are found in the lower littoral and down to considerable depths ; they are recorded, for instance, from Florida, " in shallow water to 45 metres " ; from the West Indies " in shallow water to 30 metres ; from Mauritius, " in shallow water to ca. 25 fathoms (approx. 46 metres) from California " in 2–3 metres and in drift weed ". Very little information is available concerning the temperature of waters in which *Eucheuma* is found, but specimens collected by Yale Dawson in California are said to occur in water with a temperature of 24·8° C. to 26·6° C. in May.

The original specimens of *Eucheuma cottonii*, one of the two species which prompted the present enquiry, were dredged off Saya de Malha and Cargados Carajos at depths of 45 and 46·8 metres. These two localities are on a submerged crescent shaped reef which emerges at its southern end as the island of Mauritius. Dr. Boergesen records seven species from Mauritius but qualifies this by saying that several of them may well prove to be but forms of one very polymorphic species. Apart from these taxonomic considerations it seems likely that *Eucheuma* may be found in considerable quantity along the whole of the Seychelles Ridge as far south as Mauritius. There is evidence that it has been known in this area for a very long time ; a specimen in the Kew Herbarium bears the legend " Entered at New York Customs House as French Moss " which suggests that *Eucheuma* had some economic importance when the French occupied Mauritius, probably at the time the French East India Company held sway there.

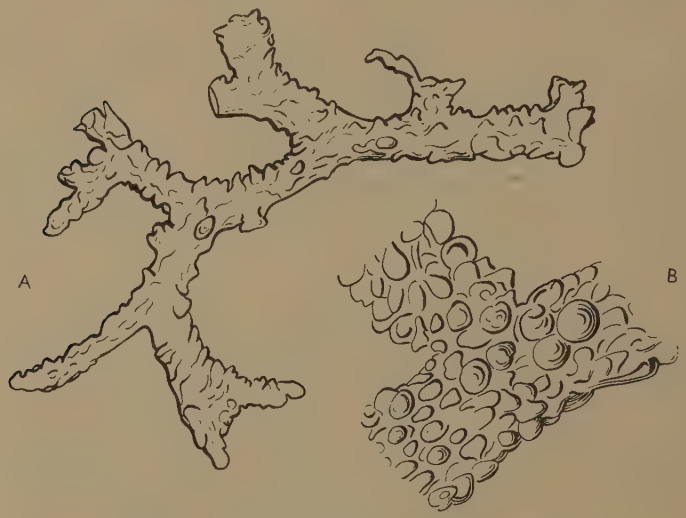

Fig. 1. *Eucheuma cottonii* W.v.B. Saya de Malha.

A. Specimen from the type gathering, drawn from the dried material, approx. × 1.

B. Part of the holotype ; the reverse side of that shown in the original drawing by Mme. Weber van Bosse, approx. × 2.

The Zanzibar Specimens. The type of *E. serra* J. Ag. one of the two species represented in the Zanzibar collection, is not available for examination and the identification rests on evidence from literature supplemented by Kylin's excellent photograph of the type. The other species could not be identified either from material at Kew or from literature. Although the sample seemed to approximate to *E. cottonii* as described by Mme. Weber van Bosse, it could not be determined as such with confidence. The position has since been somewhat clarified by an examination of the type from the Rijksherbarium, Leiden. *Eucheuma cottonii* W.v.B. was described in 1913 from the collection made by Stanley Gardiner while he was on the " Sealark " expedition to the Indian Ocean

in 1905, and so far as is known the Zanzibar specimens are the only ones recorded since the species was discovered.

From the original description it is evident that the author regarded *E. cottonii* as having a prostrate dorsiventral thallus, though I am, however, of the opinion that this is incorrect, and that the species has a cylindrical thallus, but that the type specimens were growing in a situation which gave them some appearance of dorsiventrality. The packet from the Leiden herbarium contains 3 small specimens, one of which is shown in fig. 1 A. The other two are (1) a slightly larger specimen with several branches ; this is the one figured by Mme. Weber van Bosse and is presumably the holotype, and (2) a fragment about 5·5 cms. in length with one small branch. All the specimens appear to have been soaked and afterwards heavily pressed and they are not in good condition. On the largest of the three specimens, a part of which is shown in fig. 1 B, there are globular protuberances, which so far as the limited examination allowable will reveal, appear to be immature cystocarps. The sterile and the apparently fertile portions shown in fig. 1 B, bear a sharp resemblance to portions of the Zanzibar specimen shown in figs.

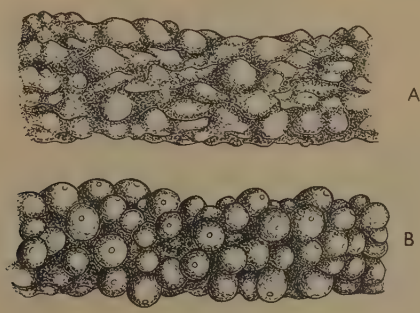

FIG. 2. *Eucheuma cottonii* W.v.B. Zanzibar.

A. Part of a sterile branch × 2.

B. Part of a fertile branch × 2.

2 A and 2 B, bearing in mind that one is drawn from dry and the other from soaked material. The branching as a diagnostic character is difficult to assess ; that of the Zanzibar material is somewhat irregular ; it may take place at rather short intervals as in fig. 3, or the plant may grow to a length of 60 cms. without branching at all. Undamaged pieces of the frond taper to the apex. Most of the *Eucheuma* species are more slender than *E. cottonii*, sterile specimens of which in the dry state may be as much as 6 mm. in diameter. A transverse section of the thallus shows that there is no central strand and that large and small cells are evenly distributed.

It is rather difficult to compare this luxuriant Zanzibar material with the fragments which make up the type of *E. cottonii*, but there are striking resemblances in the dimensions of the specimens, and also in the gross morphology of both sterile and fertile portions. The cellular structure appears to be the same and as far as one can see there is no good char-

acter which will separate the two. Under such circumstances it seems best that the Zanzibar specimens should be given the name of *E. cottonii*. Further collections from the type locality may well show that the few apparent distinctions between the two are, in fact, illusory.

FIG. 3. *Eucheuma cottonii* W.v.B. Whole plant attached to a shell ; approx, × 1, drawn from dried material soaked in salt water. Zanzibar ; communicated by the Director of Agriculture through the Colonial Products Laboratory.

The plants which have been identified as *Eucheuma serra* J. Ag. (fig. 4 A), belong to the section Axifera and are in marked contrast to *E. cottonii*. They appear to grow in tufts 15 cms. or more in diameter and they are profusely branched. The main branches are irregularly papillose or spinose while the subsidiary branches are less so. The ultimate branches taper, and most of them show a more or less verticillate arrangement of the spines. When the plant is moist only the older parts are rugose, (fig. 4 B), the remainder being quite smooth. Illustrations of *Eucheuma muricatum* (Gmel.) W.v.B. and *Eucheuma serra* may look somewhat alike since both may show in part a verticillate arrangement of the spines but *E. serra* has a much more regular branching habit and its thallus is little more than half the diameter of that of *E. muricatum*.

It would be interesting to have fertile material of this species to discover if, as some authors have suggested, *E. nodulosum* Aresch. and *E. serra* J. Ag. are in fact different phases of one species.

FIG. 4. *Eucheuma serra* J.Ag. Zanzibar.

A. Whole plant except the basal part, approx. × 1, drawn from dried material soaked in salt water.

B. Basal part of the main axis of a slightly larger plant than the one shown in FIG. 4A, drawn from dried material soaked in salt water, × 1·5.

***Plant Respiration ; an " evolutionary vestige or mere irrelevance " ?**—To British plant physiologists it is perhaps impossible to think of " respiration " without also having W. O. James, Reader in Botany at Oxford, in their minds. It is therefore a pleasure to draw attention, albeit somewhat belatedly, to his authoritative book entitled " Plant Respiration " in which he summarizes our present knowledge of this all important topic. The subject is presented in 10 chapters under such titles as " The Respiratory System ", " Respiratory Drifts ", " Glycolysis ", " Oxidation Mechanisms " and " Connexions with other Processes ". At the end of the book there are a bibliography and an index. The book, which will be most widely read by advanced students and research workers, exhibits throughout the masterly exposition of a difficult subject that one would expect from its author, and we owe him a debt of gratitude for finding the time to present his knowledge of a subject which has interested him for so many years within the compass of a relatively short volume.

One cannot refrain from quoting the following passage from the author's concluding remarks, for it reveals so clearly how the master artist, having depicted his subject with carefully selected and intricate brush strokes, can stand back from his canvas and, after seeing his landscape in its true perspective, make useful comments on its true significance. How refreshing it is to find that even amongst botanists there are still some who have not lost the art of doing this. The passage reads as follows. " The simultaneous occurrence of life and respiration has been the subject of frequent remark ; and so far as active life and active respiration are concerned appears to have no exceptions. The conclusion has been drawn that, since life never occurs without respiration, respiration must be essential to it. The same type of argument has not been so popular as a proof, for example, that the human young, never lacking a vermiform appendix, could not be safely born without it ; or that pillar boxes could not perform their postal function upon ceasing to be red. There does not appear to be any *a priori* reason why plant respiration should not prove to be, for example, an evolutionary vestige or mere irrelevance ".

C. R. Metcalfe.

* " Plant Respiration " by W. O. James, M.A., F.R.S. pp. ix + 282, 66 figs., 42 tables ; Oxford, University Press 1953 ; 30/- net.

NOTES ON THE TROPICAL AFRICAN CANELLACEAE

B. Verdcourt
(East African Herbarium, Nairobi)

In the course of the preparation of the account of the family *Canellaceae* for the Flora of Tropical East Africa two new names were found necessary. These taxa are validly published here.

The author became suspicious of the distinctness of *Warburgia ugandensis* Sprague when material of a *Warburgia* from Msumbugwe near Pangani, Tanganyika Territory was collected by M. Gane in 1950. This gathering was unfortunately sterile but so like *W. ugandensis* in foliage that it seemed probably conspecific with that species. No isotypes of *W. stuhlmannii* Engl. appear to exist and the type was burnt at Berlin during the war but it is safe to assume that the Msumbugwe material represents that species since the type locality is within a few miles of that place. The author therefore at first considered the two so-called species to be most probably conspecific. This view was published by Dale*. Flowering material from Pangani was sought for three years and finally collected in great quantity by B. Gilchrist, Provincial Forest Officer, Lushoto, to whom the author is indebted. This material is made the neotype of *W. stuhlmannii* Engl. (see below) and there is enough to provide numerous isoneotypes for distribution. Material in spirit was also collected. A study of this material has shown many differences between the two forms. *W. ugandensis* is abundant around Nairobi and ample fresh material has been studied. Gilchrist later collected fruiting material from the same tree at Pangani on two occasions and demonstrated that my suspicions were quite wrong and that the species were indeed distinct. A further plant has been collected by J. M. Bryce and W. J. Eggeling on the Rondo Plateau, southern Tanganyika. After a close study of this it has been decided that it is no more than a subspecies of *W. ugandensis*. The differences are only quantitative in nature and perhaps the result of geographical and ecological isolation. Finally an entirely new and very distinct species has been collected near Dar es Salaam, Tanganyika, by S. Paulo of the Tanganyika Forest Department.

Sprague distinguished his *W. ugandensis* from *W. stuhlmannii* by the longer petals, subcapitate stigma, and more numerous ovules arranged biseriately. The flowers are undoubtedly larger and the ovules three times more numerous. The ten ovules of *W. stuhlmannii* are actually arranged biseriately but there are only two ovules on each placenta. The style apex when examined in dry material does appear somewhat different in the two species. In *W. ugandensis* it is obconic, truncate, obscurely lobed at the apex appearing as a circle divided into five sectors and the side bears five darker oval glandular stigmatic patches. When a fairly mature ovary is examined alive the green style and blackish stigmatic patches appear glabrous but when dry or soaked material is examined the side of the style appears covered with patches of white membrane. In *W. stuhlmannii* this membrane appears rather fimbriated. These membranes are, however, glandular secretions and not true hairs or tissues. The plate illustrating Sprague's description of *W. ugandensis*

* Dale, I. R., W. J. Eggeling, ' Indigenous Trees of the Uganda Protectorate ', ed. 2, 71 (1952).

shows a style apex seemingly crowned by a ring of triangular scales—far removed from the truth. Engler (1921) mentioned the difference in fruit size which is the real criterion but the author at first believed that this might be based on immature material.

The taxa which are being recognised may be distinguished as follows. *W. stuhlmannii* has small flowers, the staminal tube being about 3·7 mm. long and 1·2 mm. in diameter, 10 ovules and small fruits about 1·5 cm. in diameter. *W. ugandensis* has considerably larger flowers, the staminal tube being 5 mm. long and 2–3 mm. in diameter, 30 ovules and much larger fruits. *W. ugandensis* subsp. *longifolia* has the staminal tube 3·5–4·5 mm. long and the leaves narrower than in any of the other taxa ; there are about 30 ovules. The anthers are 1·0 mm. long in *W. stuhlmannii*, 2·0 mm. long in *W. ugandensis* and 1·5 mm. long in subsp. *longifolia*. *W. elongata* is at once distinguished by its elongate fruits. An enumeration follows of all the material seen. It has been thought worthwhile to repeat in full Gilchrist's very informative field note.

Warburgia stuhlmannii *Engl.*, Pflanzenwelt Ost-Afrikas, **C,** 276 (1895) ; Warburg in Engl. & Prantl., Nat. Pflanzenfam. **3** (**6**), 318 (1895) ; Engl., Pflanzenwelt Afrikas, **3** (**2**), 545, fig. 246 (1921).

Kenya. Kwale District, Ngoa near Vanga, in savannah, Nov. 1929, *Graham* 2208 (EA, K) :—tall tree, bark light, rather rough with small longitudinal and horizontal splits, flowers green, strongly scented ; powdered barkmixed with water and used for toothpaste, " mkaa " (kiswahili).

Tanganyika. Mpizi, near Pangani, 200 m., *Stuhlmann* 156 (B, holo., destroyed). Msumbugwe, 32 km. SW. of Pangani, in forest patch, 200 m., 23 Nov. 1953, *Gilchrist* 1 (neotype, EA, holo., K, TFD, iso., abundant material at Kew for distribution) :—tree 12 m. tall with a breast-height girth of 1 m. but many specimens nearby grow to larger sizes. This specimen was chosen because it was in flower and was standing in a small thicket clump (from which the crown was emergent) on an old termite mound within wooded grassland. Bole cylindrical and free of branches for 3 m., crown moderately compact, angle of branching 45° maintained for a metre from the main stem after which branch growth is irregular. Surface colour of bark from light to dark yellow-grey-brown, bark splitting in roughly rectangular plates of 5–7·5 cm. by 2·5 3·5 cm., bearing the irregular remains of older layers of bark upon them. Slash :—bark about 2 cm. thick built up of about 5 bands of alternating wide dark-coloured and narrow light-coloured layers of the same general colouring as the bark surface, outer bark (at this time of the year only ?) stripping readily from the under bark, exposing a pinkish-mustard coloured slightly irregular surface. Inner bark about 6 mm. thick ; when fresh exhibiting faint lines about 1·5 mm. apart. The colour varied from a dull strawberry red, paling inwards to almost white close to the cambium. Sapwood white. The colour of all the layers of the inner bark darkened slightly on exposure ; even the innermost layers became slightly pink. Mature leaves dark green and shining above, light green below. Costa very light green above and below ; veins not conspicuous. Young leaves light yellow-green. Twigs smooth, light brown, with small circular patches of lenticels. Roots light ochre-brown with raised crater-like lenticel patches. Flowers beginning to open on 23.11.1953 during abnormally wet year in which the season of flowering may have been later than usual. Corolla yellow-green. Special properties : scent.—the scent is greatest in the inner bark and also in the vicinity of the cork cambium, the pinkish-mustard coloured surface exposed at the line of separation of the inner and outer bark. A piece of this surface, or from the inner bark, even from a dried specimen, if chewed, imparts a tingling sensation to the tongue like pepper. Outside this layer the lower layers of the outer bark are also scented but in the older external bark layers the scent has been lost. Heartwood scented but not the sapwood. Leaves not scented but slightly peppery if chewed. The roots under their bark contain large amounts of the peppery compound. Associates within the thicket clumps—principally trees of *Warburgia* and also *Lannea stuhlmannii* (on the edges), *Euphorbia*, *Tamarindus indica*, *Fagara* sp. In the grassland—*Combretum* spp., *Acacia campylacantha*, *Lannea stuhlmannii*, *Pteleopsis myrtifolia*, *Albizia versicolor*, *A. anthelmintica*, *Ostryoderris stuhlmannii*. Same locality and tree, 31 Jan. 1954, *Gilchrist* 2 (EA) : –fruit globose up to 12–13·5 mm. in diameter, apple green with waxy bloom, surface sometimes marked with corky scabby patches, base of style persistent as a black projection up to 1 mm. long ; occasional exudation from

surface of the fruit of a very clear substance setting moderately hard, contains peppery aromatic substance. Same locality, 31 Mar. 1954, *Gilchrist* 3 (EA) : fruits globose, ripe, 14 by 14 mm. Same locality, 6 Feb. 1950, *M. Gane in A.H.* 9922 (EA) :—" pilipili mwitu " (kiswahili = wood pepper), " mkarambate " (kisigua).

Warburgia ugandensis *Sprague* in J. Linn. Soc., Bot. **37,** 498–9 (1906). *W. breyeri* Pott in Ann. Transvaal Mus. **6,** 60 (1918).

Belgian Congo. Rutshuru, in *Andropogon* grassland, 20 Nov. 1914, *Bequaert* 6260 (BR).

Uganda. Toro, Kibale Forest, 1300 m., Oct. 1905, *Dawe* 510 (K, holo., ENT, iso.) :—large tree to 27 m., girth 9–12 [units not given] or more, resinous timber like sandalwood, resin used by natives for fixing tools in handles, " musuko " (vernac.). Same locality, Aug. 1936, *Eggeling* 3137 (K) :—tree 36 m. tall, fruits green. Same locality, Aug. 1936, *Eggeling* 3131 (K) :—tree 42 m. tall, bark light brown, divided into rectangles.

Kenya. Nyeri, 1700 m., 5 Mar. 1922, *R. E. & Th. Fries* 2158 (K, BR) :—tall tree by streams. Narok District, Lemek Valley, 14 Sept. 1949, *Hornby* 3086 (EA, K) :—evergreen tree occurring as forest relict on disturbed ground below present level of dry forest. Mara Masai Reserve, Egerok, 1560 m., 21 Sept. 1947, *Bally* 5425 (K). Kedong, Mt. Margaret Estate, 1890 m., June 1940, *Bally* 959 (K). Nairobi Arboretum, probably relict of original vegetation, 1650 m., 3 March 1952, *G. R. Williams* 360 (EA, K) :—branched tree to 10·5 m., unripe fruits green. Same locality, 23 July 1952, *G. R. Williams* 495 (EA, K) :—evergreen tree to 12 m., flowers greenish, " muziga " (kikuyu). Nairobi, *Battiscombe* 99 (K) :—bark used as a purgative ; " miziga " (kikuyu). Ngong, 1800 m., 25 Feb. 1932, *Napier* 1796 (K) :—medium sized tree ; flowers green, waxy. Kikuyu, 2100 m., 25 May 1931, *van Someren* 1158 (K) :—small tree or bush ; leaves very pungent ; said to be used in curry by Indians ; " mutheka " or " museka " (kikuyu). Meru District, Lare, July 1939, *Lewis* 193 (EA). Kedong Escarpment, Nakuru Road, 19 Feb. 1952, *Harcourt* s.n. (EA) :—leaves bright glossy green, flowers green, solitary, fruit green, exuding resin spots, " o-soghonoi " (kimasai). Sotik, relict of original forest, 15 June, 1953, *Verdcourt* 960 (EA, K, MO, PRE) :—tree to 15 m., leaves very dark shiny green above, flowers greenish, androecium yellow-green. Kikuyu, Muguga, 2200 m., 13 Sept. 1953, *Verdcourt* 1010 (EA, K, MO, PRE) :—woodland relict, 4·5–6 m. tall, fruits green 2·5–5 cm. in diameter.

Tanganyika. Bukoba District, Minziro Forest Reserve, Kabobwa, Sept. 1950, *Watkins* 518 *in F.H.* 3257 (K, EA, TFD) :—tall tree to 30 m., always confined to termite-hills in this dense semi-swamp evergreen forest, wood greenish, bark smelling strongly of sandalwood. Ditto, Kagera River, seasonal swamp forest, 1300 m., Aug. 1939, *Wigg in F.H.* 1508 (EA, TFD) :—" muhiya " (Ziba). W. Usambaras, Schume, 2000 m., 10 Mar. 1946, *Silvana Abedi in F.H.* 1459 (EA, TFD) :—in dry upland forest ; " mlifu " (kishamb). Ditto, Feb. 1950, *M. Gane in A.H.* 9927 (EA) :—" mlifu " (kishamb). Ditto, Mamboya, Shume-Malindi Road, 2000 m., Aug. 1950, *Greenway & Verdcourt* 8463 (EA, K) : a much-branched evergreen tree up to 15 m. tall with narrow columnar crown and pendulous branchlets, bark brownish-grey crocodile fissured and rough ; flowers green in the axils of the leaves ; fruits green, glossy, oval, about the size of a plum ; locally dominant with *Juniperus procera*, *Olea chrysophylla*, *Teclea simplicifolia* and *Scolopia* in forest on a brownish-red loam overlying gneiss rock.

Transvaal. Pietersburg, Drakenburg Mts., Macoutsie, July 1917, *Breyer in Transvaal Museum* 17573 (PRE, holo., EA, K, iso. of *W. breyeri*). Pietersburg, Tzaneen, Aug. 1917, *MacCallum in Gov. Herb.* 15483 (K, PRE). Pietersburg, Blauwberg, Apr. 1954. *Codd* 8733 (K, PRE).

Note : The very tall forms over 33 m. tall and with bark smelling strongly of sandalwood which occur at Bukoba and in Uganda appear to be the same subspecies as the shorter Kenya and Usambaras form but further field work is needed.

Warburgia ugandensis *Sprague* subsp. **longifolia** *Verdcourt* subsp. nov. ab subsp. *ugandensi* foliis angustioribus differt.

Folia petiolata, lamina anguste oblongo-lanceolata, leviter falcata, 7–12 cm. longa et 1·7–2·1 cm. lata. *Stamina* 10 in synandrium cylindricum, 3·5 mm. longum connata, thecis 1·5 mm. longis.

Tanganyika. Lindi District, Rondo Plateau, 5 Mar. 1951, *Bryce* 1 (EA, holo., K, iso., TFD, iso.). Same locality, Feb. 1951, *Eggeling* 6057 (EA, K, TFD) :—tree to 27 m., trunk grey-brown, deeply fissured, main limbs ascending, ultimate branchlets drooping.

Warburgia elongata *Verdcourt*, sp. nov. ab speciebus africanis adhuc descriptis fructu elongato clavato valde differt.

Arbor parva glabra vel arbuscula basi parce ramosa, usque 6 m. alta. *Rami* arcuati, cortice laevi griseo-brunneo lenticelloso obtecti, internodiis 1–2·5 cm. longis ; gemma terminalis sublata, 7 mm. longa. *Folia* breviter petiolata ; lamina elliptica vel oblongo-oblanceolata, leviter falcata, apice obtuse acuta, basi in petiolum anguste alatum 3–7 mm. longum angustata, chartacea, densissime pellucido-punctata, minute rugulosa, integra, 4–15 cm. longa et 2–5·5 cm. lata, margine leviter reflexo, costa prominente brunnea, nervis lateralibus 15–20 et venis utrinque leviter prominulis. *Cymae* axillares, 1–2-florae, pedicellis circa 2 mm. longis. *Bracteae* semi-rotundatae, 2–3 mm. longae et 3·2–4·5 mm. latae. *Sepala* convexa, elliptica vel obovato-spathulata apice rotundata, 4–6·5 mm. longa et 2–4·5 mm. lata. *Petala* oblongo-spathulata, 3·5–6 mm. longa et 1·5–2·5 mm. lata. *Tubus staminalis* 5–5·25 mm. longus, apice decemcrenulatus ; thecae c. 2–2·5 mm. longae, 2·75 mm. supra basin tubi sitae. *Ovarium* fusiforme, 4·5 mm. longum, 1·75 mm. diametro, glabrum ; stigma sessile subcapitatum, apice 5-dissectum latere stigmatibus rotundatis 0·5 mm. latis affixum ; placentae 5, parietales, ovulis 26 irregulariter biseriatis. *Bacca* elongato-clavata, basi angusta, apice obtuse apiculata, 5·5–6 cm. longa et 2 cm. diametro. *Semina* immatura 6 mm. longa, matura ignota.

Tanganyika. Eastern Prov., Kisarawe District, Vikindu Forest Reserve, Sept. 1953, *Paulo* 157 (EA, K) :—small tree. Same locality, about mile 15, Dar es Salaam–Utete Road, near Vikindu, 30 m., 31 Mar. 1954, *Greenway in E.A.H.* 10512 (EA) (bark specimen only) :—an evergreen shrub with a rounded spreading crown up to 6 m. tall, stems 1–6, rather arching and branchlets ultimately drooping ; bark grey-brown, smooth with large scattered cinnamon-coloured lenticels, under bark purplish-red with pink streaks, bast cream-coloured, wood pale brown ; where injured the bark peels off in thin skin-like flakes. A locally common semi-undergrowth shrub on a stream bank associated with rare *Khaya nyasica*, scattered *Macrolobium coeruleum*, *Afzelia quanzensis*, *Parkia filicoidea*, *Pteleopsis myrtifolia*, *Trachylobium verrucosum*, *Barringtonia racemosa*, *Uapaca sansibarica* and frequent *Garcinia livingstonei* in a grey sandy loam ; fruits eaten by Africans, birds, bats, monkeys and wild pig ; " mka'nga " (kizaramo). Same locality, 6 May 1954, *Omari* (EA) :—large undershrub or understorey tree. Same locality, 17 May 1954, *Eggeling* 6813 (EA, holo., K, iso.) :—understorey tree at slope bottom on edge of *Pandanus–Raphia* swamp, flowers yellow-green (spirit material at EA.).

NOTES ON ASIATIC GRASSES : XX.

Indian Grasses in Roth's Herbarium.

N. L. Bor

In 1821, Albrecht Wilhelm Roth published a book, *Novae Plantarum Species*, which was to a very large extent based upon the collection of plants put together by Benjamin Heyne, a missionary of the Tranquebar Mission, a body of evangelists sponsored by the Moravian Brothers.

When Heyne arrived at Tranquebar—a port on the East Coast of Madras in 1777, the experienced botanist Koenig was also a member of the mission. He taught Heyne the elements of botany and Heyne explored the countryside and made a collection of dried plants. In 1790 he passed into the service of the East India Company when he succeeded Roxburgh in charge of the experimental garden maintained by the Madras Government at Samalcottah (Samalkot) on the northern bank of the Godaveri river. In 1813 Heyne proceeded on leave with his plants. During his leave he visited London and worked out his plants with the help of Banks' collections. Before he returned to India, he made over the whole of his collection to A. W. Roth in 1816.*

As stated above, Roth published the result of his labours in 1821 in a book, giving Heyne the credit for any determinations correctly made.

Before Roth's book was published, however, the manuscript was lent to Roemer and Schultes who were at work on the 15th edition of Linnaeus' *Systema Vegetabilium*. All the names proposed by Roth and Heyne were taken up and published, in some instances new names being given where the specific epithet was occupied in the name of a previously described plant. The 15th edition of the *Systema* was published in 1817, so that this is the work that must be quoted when Roth's new species are cited.

Roth's herbarium was purchased by the authorities of the Botanischer Garten und Museum, Berlin, from the Naturhistorisches Museum zu Oldenburg in 1925, and it was incorporated in the general herbarium. During the last war, in 1943 to be exact, the Herbarium at Berlin was almost totally destroyed, and with it a large portion of Roth's herbarium. Of the 46 grasses from India in the Roth Herbarium, only 13 had escaped destruction.

The Director of the Berlin Herbarium, Professor Dr. Werdeman, was good enough to send to Kew all that remained of the grass specimens collected by Heyne in the plains of Coromandel, and a short account of them follows. It was great good fortune to discover that the type sheets of *Digitaria setigera* Roth, *D. stricta* Roth, *Tripogon bromoides* Roem. et Schult., *Isachne meliacea* Roth and *I. pulchella* Roth are all safe and sound at Berlin.

In the following list all the names in Clarendon type are the correct names for the species.

1. *Panicum subcordatum* Roth, Nov. Pl. Sp. 46 (1821).

This plant was considered by Roemer et Schultes, Syst. Veg. ed. 15, **2,** 480 (1817) to belong to the genus *Echinochloa*, although they agreed

*See History of Botany in India by I. H. Burkill in Journ. Bomb. Nat. Hist. Soc. **51,** 855-6 (1954).

that it had much in common with *Brachiaria setigera* (Retz.) Stapf. The plant is mentioned by Hook. f. in his remarks under *Panicum prostratum* Lamk. The plant is, however, **Brachiaria villosa** (*Lamk.*) *A. Camus.*

2. *Panicum heynii* Roth, Nov. Pl. Sp. 49 (1821) ; Roth ex Roem. et Schult. Syst. Veg. ed. 15, **2,** 458 (1817).

This plant under the same name, was also considered by Steudel to be a good species. Hooker, in the Flora of British India, was unable to place it, and relegated it to the doubtful and excluded species of *Panicum*. Actually the plant is **Panicum maximum** *Jacq.*

3. *Panicum obliquum* Roth, Nov. Pl. Sp. 51 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** 433 (1817). This plant is a *Cyrtococcum* and is actually **C. patens** (*Linn.*) *A. Camus*, but it is not what Hook. f. called *Panicum patens* Linn.

4. **Digitaria stricta** Roth, Nov. Pl. Sp. 38 (1821) ; Roth ex Roem. et Schult. Syst. Veg. ed. 15, **2,** 474 (1817).

In the Flora of British India this species appears under the name *Paspalum royleanum* Nees, Hooker having failed to identify it with the description of *Digitaria stricta* Roth. The latter name is mentioned in that work (p. 59, *Panicum kunthii* Steud.) under the heading, " doubtful and excluded species " of Panicum, and was presumed by Hooker, to be the same as *Setaria stricta* Kunth (as indeed it is), and he went on to say, " I have failed to identify the plant. It is possibly a Paspalum ". Hooker was merely following Steudel who transferred *Setaria stricta* to Panicum, changing the name to *Panicum pseudosetaria* because of the earlier *Panicum strictum* R. Br. (1810). Incidentally Hooker quotes this latter name as *Panicum pseudostricta* Steud., a lapsus that was corrected in the index.

This specimen was not seen by Henrard when he monographed the genus *Digitaria* and was presumed, even definitely stated, to have been lost in the destruction of the herbarium at Berlin-Dahlem in 1943. It is a pleasure to be able to record that the specimen is safe. In the type the racemes are extraordinarily long (up to 18 cm. long), and the spikelets are almost devoid of an upper glume, in fact the glume has fallen from the majority of the spikelets.

5. **Digitaria setigera** *Roth*, Nov. Pl. Sp. 37 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** 474 (1817).

Hook. f., Flor. Brit. Ind. **7,** 14 (1896) included this name in the synonymy of *Paspalum sanguinale* Lamk. as var. *extensum* Hook. f. It appears in Henrard's *Monogr. Digitaria*, 686 (1950) under the name *D. corymbosa* (Roxb.) Merr. since Henrard was under the impression that the type sheet had been lost in the destruction of the Berlin herbarium. He pointed out that Roth confused *D. horizontalis* and *D. setigera* in his account of the latter, and concluded that *D. setigera* was a nomen confusum and since the type had been lost that it was better to adopt Merrill's name. There can be little doubt that Roth did confuse *D. horizontalis* and *D. setigera*, and it says not a little for Henrard's perspicuity that he

discovered this, but since Roth selected and named two sheets in his herbarium as *D. setigera* Roth, the plant represented on the sheets must be taken as the type.

6. *Panicum hirtum* Heyne ex Roth, Nov. Pl. Sp. 46 (1821).

In Syst. Veg. ed. 15, **2,** 485 (1817) the plant is listed by Roemer et Schultes as a doubtful species of *Oplismenus*. Hook. f., Flor. Brit. Ind. **7,** 34 (1896) was more definite and stated, " Wight (Cat.) includes under *procumbens* Nees, besides most of the above, *P. hirtum* Roth (*P. Rothii* Spreng.) which is *Oplismenus* ". Actually the plant is **Urochloa panicoides** *P. Beauv.*

7. *Panicum difforme* Roth, Nov. Pl. Sp. 52 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** 433 (1817).

This is the grass now known as **Cyrtococcum trigonum** (*Retz.*) *Stapf.*

8. *Panicum abludens* Roem. et Schult., Syst. Veg. ed. 15, **2,** 457 (1817) ; et in Roth, Nov. Pl. Sp. 53 (1821).

Roth called this plant *Panicum paradoxum* in mss. This name was altered to *P. abludens* Roem. et Schult. doubtless because of the earlier *P. paradoxum* R. Br., Prodr. 193 (1810). In the Flora of British India, 7, 59 (1896) Hooker says that *Panicum paradoxum* Roth (per errorem Rottle.) is evidently a *Paspalum.*

This grass is **Digitaria granularis** (*Trin.*) *Henr.*

9. *Panicum canescens* Roth, Nov. Pl. Sp. 54 (1821) ; Roth ex Roem. et Schult. Syst. Veg. ed. 15, **2,** 457 (1817).

Hook. f., Flor. Brit. Ind. **7,** 81 (1896) assumed that the plant was the same as *Setaria canescens* Kunth, and placed it among the undeterminable species of *Setaria.*

The grass represented on the sheet is **Bracharia ramosa** (*Linn.*) *Stapf.*

10. **Isachne miliacea** *Roth,* Nov. Pl. Sp. 58 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** 476 (1817).

This sheet bears the holotype of this species.

11. **Isachne pulchella** *Roth,* Nov. Pl. Sp. 58 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** 476, (1817).

This grass is not, as Hook f., Flor. Brit. Ind. 7, 246 (1896) assumed, *Sphaerocaryum malaccense* (*S. elegans* Nees ex Steud.). It is a true *Isachne* and a good species.

This specimen is the holotype of the species.

12. *Chloris incompleta* Roth, Nov. Pl. Sp. 60 (1821) ; Roth ex Roem. et Schult., Syst. Veg. ed. 15, **2,** (1817).

The correct name of this plant is **Chloris dolichostachya** *Lagasca,* Gen. et Sp. Pl. 5 (1816).

13. **Tripogon bromoides** *Roem. et Schult.*, Syst. Veg. ed. 15, **2,** 600 (1817).

Triathera bromoides Roth, nomen nudum ex Roem. et Schult. loc. cit.

Tripogon bromoides Roth, Nov. Sp. Pl. 79 (1821).

The name given to this plant by Roth in manuscript was *Triathera bromoides*. Roemer & Schultes accepted the specific epithet and actually furnished a description of the plant as *Tripogon bromoides*. They must therefore be cited as the authority for the species, even though Roth quotes his own name as the authority in *Novae Plantarum Species*.

NOTES ON ASIATIC GRASSES : XXI.

The species of Setaria P. Beauv. [Sect. Ptychophyllum (A. Braun) Pilger] in India.

N. L. Bor

The name *Ptychophyllum* was first published by A. Braun in Index Sem. Hort. Berol. App. (1855) 18 as a subgenus of *Panicum*. When Hooker wrote the seventh volume of the Flora of British India (1896) he still considered *Ptychophyllum* to be a well marked section of the genus *Panicum*, although he recognised the genus *Setaria*, a genus established by Palisot de Beauvois in his Essai d'une nouvelle Agrostographie in 1812.

The grasses which belong to this section are undoubtedly species of *Setaria*, and not of *Panicum*, characterised by the possession of leaves which are pleated along the main nerves. These nerves arise on the midnerve of the leaf and run parallel to one another through the mesophyll until they meet the marginal nerve as the latter curves inwards towards the tip and anastomose with it. The spikelets are the usual panicoid type subtended by sterile branches or bristles.

Two of the species found in our area are not indigenous, but are natives of Africa, viz., *Setaria megaphylla* and *S. barbata* Kunth, and it is likely that a third, *S. homonyma* Choiv. is also an introduction into India from Africa, though it is fairly widespread in northern India.

There are, however, two of the species which are indigenous and common in India about which something must be said. These are the two species *Setaria plicata* (Lamk.) T. Cooke and *S. palmaefolia* (Koenig) Stapf which appear united under the name *Panicum plicatum* Lamk. in the Flora of British India.

The first appearance of the name *Panicum plicatum* is to be found in Lamark's Encycl. Meth. Bot. 4, 736 (1791) and refers to the type in the Paris Herbarium. The type consists of a shoot without a base, carrying two leaves and the inflorescence and also a sterile shoot both of a cultivated grass grown in the Royal Gardens at Paris. The label reads " *Panicum plicatum* Lam. Ill. Gen. folia exquisite sulcato-plicata caules 2 v. 3-pedales. Ex insula franciae ? cult in horto Reg. parisiensi 1790 ".

The grass is slender, the central rhachis of the inflorescence not more than 15 cm. long, the lateral branches are about 2·5 cm. long, spiculate to the base. The spikelets are 3·5–4 mm. long.

Lamark did not know where the seed came from which gave rise to his *Panicum plicatum*, but he surmised that it might have come from Mauritius. The plant is not, however, recorded for Mauritius in Hubbard & Vaughan's book, Grasses of Mauritius, 1940, and it is more likely that it came from one of the French settlements on the coast of India. The grass is common in the Nilgiris and likely on the other hills not far from Pondicherry and Karikal.

In the synonymy of *Panicum plicatum* of Lamk. in the Flora of British India is mentioned a *Panicum palmaefolium* of Koenig. Koenig published this name in Naturforscher 23, 208 (1788) in the following words. "*Panicum arborescens* (followed by eight lines of script) . . . die *Valvulae Corollarum* steif, glatt, glänzend an den hermaphroditische Blüthen sind. —In Siam aber wächst ein *Panicum*, welches solche gefurchte Blätter hat als wie die ersten Blätter der Palmarten sind. Dieses wird über Mannshoch, und ich habe es, der Blätter wegen, *Panicum palmaefolium* genannt ; es könnte aber, füglicher als jenes, *arborescens* heissen.".

This name is said to have been inadequately published [Hitchcock, Manual U.S. Grasses 947 (1935)], but there can be no doubt what plant Koenig's description refers to. The same plant was also described by Willdenow, Enum., Pl. 1033 (1809), and he again called it *Panicum palmifolium* Willd. ex Poir., in Lam. Encycl. Meth. Bot. suppl. 4, 282 (1816). The transference to *Setaria* was effected by Stapf in Journ. Linn. Soc. Bot. **42,** 186 (1914). This species is easily separable from the former on account of its colossal leaves and panicle. It is a true forest grass and is found scrambling over other vegetation, often attaining a considerable length. *Setaria plicata* on the other hand, is more a grass of the forest margins and open country, and always retains its low compact habit which makes it such an ideal plant for edging under cultivation in tropical glasshouses.

Key to the species of Setaria (Sect. Ptychophyllum).

Perennials :—

Panicle very dense ; spikelets about 3 mm. long . . *S. megaphylla*

Panicle very lax ; spikelets 3·5–4 mm. long :—

Slender grass ; panicle not more than 25 cm. long and 5 cm. wide ; lateral branches spiculate to the base ; spikelets 3·5–4 mm. long ; leaves up to 3 cm. wide . . . . . *S. plicata*

Robust grass ; inflorescence much more than 25 cm. long, up to 50 cm. long by 20 cm. wide ; spikelets not more than 3·5 mm. long ; leaves up to 12 cm. wide . . . . . *S. palmifolia*

Annuals :—

Lower glume 3-5-nerved, about one-third the length of the spikelet ; upper glume about three-quarters the length of the spikelet ; lower floret male or barren ; branches of the panicle divided from the base and bearing short racemes of spikelets . . *S. barbata*

Lower glume obscurely 3-nerved ; upper glume almost as long as the upper lemma and covering it almost completely ; lower floret barren ; branches of the panicle mostly simple racemes, not usually divided . . . . . *S. homonyma*

Setaria megaphylla (*Steud.*) *Dur. et Schinz*, Consp. Flor. Afr. **5,** 773. (1895).

Panicum megaphyllum Steud., Syn. Pl. Glum. 53 (1854).

P. phyllomacrum Steud., l.c. 53.

A perennial grass from a stout rhizome. *Culms* 1–3·5 m. tall, very robust, erect from the base, simple or branched, terete, smooth and glabrous or rather rough below the inflorescence. *Leaf-blades* elliptic-linear, tapering to the base, drawn out gradually to a long acuminate tip, glabrous or loosely hairy on the upper surface, coarsely and extremely scabrid on the margins and on the outer nerves on the upper surface, scabrid but less so on the under surface and in the centre on the upper surface, rigid, flat, pleated and somewhat crinkled towards the base ; *sheaths* terete, striate, tightly clasping, glabrous and smooth below, pilose towards the collar and densely ciliate on both margins with tubercle-based hairs ; *ligule* a dense fringe of hairs.

Inflorescence a linear to linear-lanceolate panicle, dense or loose, up to 30 cm. long by 10 cm. wide ; axis angled, striate, very scabrid to shortly hirsute on the angles, carrying branches which are single or more often in groups or false whorls ; branches similar to the axis up to 6 cm. long, branching or rebranching, the uppermost gradually shorter. *Spikelets* solitary on the ultimate branchlets, seated on short scabrid pedicels, the lateral sometimes without a supporting bristle, the terminal always with one, about 3 mm. long. *Lower glume* broadly ovate to rotundate, membranous, smooth and glabrous, about 1–1·5 mm. long, 3-nerved ; *upper glume* broadly ovate-oblong, 2–2·4 mm. long, 5-nerved. *Lower floret* empty ; *lemma* membranous, elliptic-acute or apiculate, smooth and glabrous, 5-nerved ; *palea* a short hyaline membrane. *Upper floret* ♀ ; *lemma* elliptic-apiculate, chartaceous to crustaceous, smooth or very obscurely rugulose, turning coffee brown at maturity ; *palea* of the same texture ; *stamens* 3 ; *anthers* 1·25 mm. ; *styles* 2, distinct ; *stigmas* plumose, as long as the styles.

Ind. Or. : Cultivated at Dehra Dun, 770 m., Sept. 1892, *J. S. Gamble* 23922.

There are three sheets of this species in the Herbarium at Kew. I have not seen the species myself growing at Dehra Dun.

Setaria plicata (*Lamk.*) *T. Cooke*, Flor. Bombay, **2,** 919 (1908).

Panicum plicatum Lamk., Tab. Encycl. Meth. Bot. **4,** 738 (1791).

P. excurrens Trin., Sp. Gram. **1,** Tab. 89 (1828).

A perennial grass. *Culms* up to 150 cm. tall, but usually much less than this, terete, striate, loosely tufted, glabrous, or pilose under the panicle and below the nodes, smooth or scaberulous below the panicle and below the nodes, hairy at the nodes. *Leaf-blades* elliptic in shape, up to 40 cm. long, 3 cm. wide, tapering above to a long-drawn-out acuminate almost setaceous tip, gradually tapering below to a narrow almost petiolate base, with a very dark glandular (?) patch on each side at the base, scaberulous on both surfaces but becoming scabrid to very scabrid on the outer nerves of the upper surface and on the margins, and towards the tip, dark green on the upper surface, somewhat glaucous below, very short pubescent on the under surface with occasional hairs on the upper surface, usually furnished on the margins below with long tubercle-

based colourless hairs ; *sheaths* sharply keeled and compressed, very striate, closely fitting and clasping the culms, smooth and glabrous or with a few spaced tubercle-based hairs on the upper half which when they fall, leave the tubercles behind, densely ciliate on the margins with tubercle-based colourless hairs ; *ligule* an extremely dense row of hairs.

Inflorescence a simple panicle up to 30 cm. long, consisting of a central axis upon which are arranged short branches bearing spikelets or branched and the branchlets carrying the spikelets ; axis terete below becoming flattened towards the top, shortly pubescent becoming very scabrid upwards ; branches usually very short (5–10 mm.) but in instances where they are several cm. long, these carrying the shorter branches ; branches and branchlets scabrid, flexuous. *Spikelets* 3·5 –4 mm. long, lanceolate-acute from the back, planoconvex in profile, seated on very short scabrid pedicels, not all of which are furnished with long, slender, flexuous, scabrid bristles. *Lower glume* ovate-acute, about one-third to one-half the length of the spikelet, smooth and glabrous, 3–4-nerved ; *upper glume* about four-fifths the length of the spikelet, 7-nerved, broadly elliptic-acute in shape, smooth and glabrous. *Lower floret* barren ; *lemma* as long as the spikelet, membranous, 5-nerved, compressed firmly at the tip ; *palea* about two-thirds the length of the lemma, hyaline, much narrower. *Upper floret* ♂ ; *lemma* a little shorter than the lower lemma, chartaceous to crustaceous, pale yellow in colour, finely rugulose, elliptic-acute in shape ; *palea* of the same texture ; *stamens* 3 ; *anthers* 1·5 mm. long ; styles 2 ; *stigmas* plumose ; *caryopsis* broadly elliptic, compressed.

Ind. Or. : Assam ; Kohima, 1400 m., 25 Oct. 1885, *C. B. Clarke* 41640 ; Cherra 1500 m., 28 Sept. 1867, *C. B. Clarke* 5099A ; ibidem, 12 Aug. 1950, *Hook. f. et T. Thoms.* ; Shillong, 1700 m., 6 Sept. 1886, *C. B. Clarke* 44640.

Madras ; Conoor Ghat, 1350 m., Sept. 1883, *J. S. Gamble.*

Uttar Pradesh ; Jumna Valley, 1800 m., 2 Sept. 1883, *J. F. Duthie* 321 et ibidem 327.

Ceylon ; Kandy, Roseneath, 600 m., 28 Nov. 1950, *Ballard* 1003.

Setaria palmifolia (*Koen.*) *Stapf* in Journ. Linn. Soc. Bot. **42,** 186 (1914).

Panicum palmaefolium Koenig, Naturforscher, **23,** 208 (1788).

P. plicatum Willd., Enum. Pl. 1033 (1809) non Lamk.

P. palmifolium Willd. ex Poir in Lamk. Tab. Encycl. Meth. Bot. Sup. 4, 282 (1816).

P. nervosum Roxb. Flor. Ind. **1,** 314 (182) non Lamk.

P. neurodes Schult. Syst. Veg. **2,** Mantissa 228 (1824).

Chamaeraphis palmifolia (Willd.) O. Ktze, Rev. Gen. Pl. **2,** 771 (1891).

Chaetochloa palmifolia (Willd.) Hitch. et Chase, Contrib. U.S. Nat. Herb. **18,** 348 (1917).

A perennial grass. *Culms* up to 3 m. tall, very robust, terete, striate, branching, often sprawling over other vegetation, usually erect from the base but sometimes prostrate below and then rooting at the nodes, smooth and glabrous or scaberulous below the nodes, hairy at the nodes and often below them for some distance. *Leaf-blades* very large, up to 1 m. long by 12 cm. broad, linear-elliptic, tapering to the base, almost petiolate in the lower leaves, drawn out above into a long acuminate tip, conspicuously

pleated, flattening out but always definitely pleated, scabrid on both surfaces but more so towards and on the margins, glabrous, or softly hairy on both surfaces or with tubercle-based ciliae at the base ; *sheaths* terete, or slightly keeled, very striate, smooth and glabrous below but with tubercle-based hairs in the upper half which leave a rough surface after they fall, densely ciliate on the margins or smooth and glabrous ; *ligule* an exceedingly dense row of hairs.

Inflorescence a gigantic panicle up to 80 cm. long or more and 40 cm. wide, very loose, consisting of a central axis upon which are arranged, single or in pseudo-whorls, long flexuous or straight branches (always dropping when long) ; axis straight or nodding, sulcate on the side from which a branch or group of branches originates, increasingly scabrid upwards, glabrous but hairy at the base of the branches ; branches exceptionally up to 30 cm. long, pendulous or straight when short, carrying short subsidiary branches upon which the spikelets are carried often on short branchlets ; pedicels short, often carrying a scabrid bristle below the spikelet. *Spikelets* 2·5 3·5 mm. long, elliptic-acute in shape from the back, planoconvex in profile. *Lower glume* ovate-acute or obtuse, smooth and glabrous, about one-third the length of the spikelet, 3-nerved ; *upper glume* about two-thirds the length of the spikelet, broadly ovate-obtuse, smooth and glabrous, 5–7-nerved. *Lower floret* barren or ♂ ; *lemma* membranous as long as the spikelet, elliptic-acuminate in outline, 5-nerved ; *palea* half to three-quarters the length of the lemma, much narrower, hyaline *stamens* 3 ; *anthers* 0·75 mm. long. *Upper floret* ♀ ; *lemma* chartaceous to crustaceous ; *palea* of the same texture ; *stamens* 3 ; *anthers* 1·4 mm. long ; *styles* 2 ; *stigmas* plumose ; *grain* elliptic in outline, compressed.

Ind. Or. : Assam ; Naga Hills, Pulebadze 1500 m., 4 Aug. 1935, *N. L. Bor* 5305, ibidem, Zubza, 900 m., 3 Jun. 1935, *N. L. Bor* 4404 ; ibidem, Zhakama 1500 m., 26 Aug. 1935, *N. L. Bor* 6152.

Khasi Hill, Pundua, 11 Jun. 1850, *Hook. f. & T. Thoms.* 407 ; Nunklow, 1200 m., 11 Jun. 1850, *Hook. f. & T. Thoms.* ; Pomrang, 1500 m., 17 Sept. 1850, *Hook. f. & T. Thoms.* ; Nunkhow, 900 m. 13 Sept. 1886, *C. B. Clarke* 45682A ; Umwee, 26 Sept. 1850, *Hook. f. & T. Thoms.* ; Mamloo, 900 m., 28 Sept. 1867, *C. B. Clarke* 5440.

Plains ; Assam Plains, *Griffith* 83 ; Doimara 300 m., Oct. 1934, *N. L. Bor* 2419A ; Silhet, *Wallich* 8702 ; Nowgong Dabokia, *N. L. Bor*.

Manipur State ; Kanglatombi, 900 m., 12 Oct. 1945, *A. A. Bullock* 686.

Mishmi Hills. *Griffith.*

Bengal & Bihar ; Ranchi, Palamau, Dec. 1917 *H. H. Haines* 5291 ; Parasnath 1350 m., *Hook. f.* 664 ; ibidem, Oct. 1883, *C. B. Clarke* 33764 ; Jalpaiguri, Oct. 1895, *H. H. Haines* 563 ; Habiganj, *Griffith.*

Nepal ; 1821, Wallich 8702 and 8703.

Sikkim ; Chakoong, Oct.–Nov. 1849, *Hook. f.* ; Darjeeling, 1200 m., 11 Aug. 1875, *C. B. Clarke* 26954B. Selim, 750 m., 10 Nov. 1876, *J. S. Gamble* 1978A ; Neebong, 1200 m., 30 Aug. 1874 ; *Treutler* 680 ; Karponang, 2500 m., 20 Sept. 1945, Dr. Bor's collector.

Uttar Pradesh ; Dehra Dun, Rajpur. 900 m., Sept. 1898, *J. S. Gamble* ; Dehra Dun, 21 Sept. 1887, *J. F. Duthie* 6827 ; Kumaon, 5 Oct. 1884, *J. F. Duthie* 3509 ; ibidem, Kali Valley, 25 Sept. 1884, *J. F. Duthie* 3510 ; ibidem, Oct. 1890 *J. F. Duthie* 10754.

Punjab ; Herb. *Royle* ; Herb. *Collett* ; Herb. *Falconer*.

Bombay ; Mahableshwar, 15 Oct. 1909, *W. A. Talbot* ; Belgaum, Lambotia Hills, *Ritchie*.

Madras ; Herb. *Wight* 1648 ; Kodaikanal Ghat, 31 May 1898, *Bourne* 2995 ; Periya Shola, 13 Jul. 1898, *Bourne* 1908 ; Dhoni Hills, near Palghat, *Mayuranathan* ; Pungancheri, Coimbatore, 480 m., 20 Jul. 1910, *C. B. C.*

Fischer 2032 ; Kavalay, Cochin, Nov. 1910, 600 m., *A. Meebold* 12311 ; Tinnevelly, 18 Sept. 1915, *Bourne* ? ; Travancore, Naduvathumurhi, 26 Aug. 1913, *Calder and Ramaswami* 170 ; Annamallays, 1866, *R. A. Beddome*.

Ceylon ; *Thwaites*, C. P. 890 ; *Gardener* 977 ; Peradeniya 16 May, 1922, *Stockdale*.

Burma ; Rangoon, 5 Feb. 1854, *McClelland* ; Shan Hills, 1200 m., 1888, *N. Maroder* ; *Wallich* 1647 ; Katha, Hlebwe to Manci, 4 Dec. 1908, *J. H. Lace* 4458 ; Katha, 10 Nov. 1911, *idem* 5529 ; ibidem, Bilumyo Reserve, 240 m., 10 Nov. 1911, *J. H. Lace* 5529 ; N. Shan States, Gokteik Gorge, 540 m., 8 Oct. 1911, *J. H. Lace* 5453 ; Hanthawaddy, 14 Sept. 1932, *C. E. Parkinson* 14992 ; Meiktila, Chonemadwin-yo, 900 m., 22 Oct. 1936, *H. C. Smith* 16275—Burmese name—Myet-pya-paw.

Setaria barbata (*Lamk.*) *Kunth*, Rev. Gram. **1,** 47 (1829).

Panicum barbatum Lamk., Tab. Encycl. Meth. Bot. **1,** 171 (1791).

Chaetochloa barbata (Lamk.) Hitchc. et Chase, Contrib. U.S. Nat. Herb. **18,** 348 (1917).

Panicum flavescens Griseb. of the Flor. Brit. Ind. **7,** 56 (1896) non Swartz.

P. costatum Roxb., Flor. Ind. **1,** 314 (1820).

An annual grass. *Culms* erect or ascending from a long prostrate base, rooting at the nodes, up to 1·5 m. high, terete, branched, glabrous and smooth or scabrid below the inflorescence and sometimes hairy below the nodes. *Leaf-blades* tapering at both ends, at the distal end tapering to a long acuminate setaceous tip, linear-elliptic in between, up to 30 cm. long by 3·5 cm. broad, closely pleated and crinkled when young, when old, flattened, but the pleats never quite disappearing, fairly firm to more or less flaccid, more or less hirsute on both surfaces, the hairs being sparse on the upper surface, scaberulous on the lower surface, very scabrid on the margins, the margins towards the base often coarsely ciliate with tubercle-based hairs ; *sheaths* more or less compressed and keeled, the lower rather loose and falling from the culms, the upper tighter, clasping, hirsute with tubercle-based hairs, the hairs increasing in number from below upwards, ciliate on the margins with the same kind of hairs, markedly striate ; *ligule* reduced to a densely ciliate rim.

Inflorescence a linear to linear–oblong panicle, often rather loose and irregularly interrupted, up to 15 cm. long by 3 cm. wide ; axis straight or slightly curved, angled and sulcate, more or less hairy scabrid on the angles ; branches alternate or in groups or false whorls up to 4 cm. long but decreasing in length from below upwards, sometimes branched ; branchlets similar to the axis but thinner and pilose. Spikelets seated on short stumps, each almost always supported by a long capillary flexuous scaberulous bristle. *Spikelets* ovate-oblong or oblong-obtuse, 2·5–3 mm. long. *Lower glume* 0·75–0·9 mm. long, orbicular, 3–(5)-nerved, smooth and glabrous, membranous ; *upper glume* very broadly ovate-elliptic, about three-quarters the length of the spikelet, smooth and glabrous, 7–9-nerved. *Lower floret* empty or ♂ ; *lemma* broadly elliptic-apiculate, 7-nerved, membranous ; *palea* as long, 2-keeled ; *stamens*, if present, 3 ; *anthers* 0·5 mm. long. *Upper floret* ♀ ; *lemmas* as long as the spikelet, chartaceous to crustaceous, definitely rugose, glabrous, elliptic-apiculate ; *palea* of similar texture, rugulose ; *stamens* 3 ; *anthers* 0·75 mm. long ; *styles* 2 ; *stigmas* plumose, as long as the styles.

Ind. Or. : Assam ; Garo Hills, Tura, 390 m., 6 Feb. 1929, *Parry* 775.

Bengal ; Calcutta, 11 Jan. 1885, *C. B. Clarke* 37078B ; Howrah, 15 Sept. 1894, *I. D. Naskar* 1300.

Madras ; *Bourne* 3153.
Ceylon ; Peradeniya, 11 Oct. 1926, *A. H. G. Alston* 297 ; leaves plicate, doubtfully native.
Burma ; Rangoon, roadside Pagoda and Godwin roads, 28 Oct. 1948, *U Thein Lwin* 608.

Setaria homonyma (*Steud.*) *Chiov.* in Nuovo Giorn. Bot. Ital. n.s. **26,** 78 (1919).

Panicum homonynum Steud., Syn. Pl. Glum. 48 (1854).

P. chamaeraphis Nees ex A. Br. in Ind. Sem. Hort. Berol. App. 20 (1855) non Trim.

P. rhachitrichum Hook. f., Flor. Brit. Ind. **7,** 56 (1896) non Hochst.

Annual grass. *Culms* erect or ascending from a prostrate base, and rooting at the nodes, loosely tufted, terete, slender, smooth and glabrous, except at the nodes which are hairy, branched or simple. *Leaf-blades* elliptic in shape, contracted at the base, or in the lower almost petiolate, tapering to an acute or acuminate tip, flat, flaccid, pleated and crinkly below when young, when old flattening out almost completely, up to 25 cm. long, 4 cm. broad, green above, somewhat glaucous below, scaberulous on both surfaces, glabrous or perhaps more often with sparse tubercle-based hairs on the nerves ; *sheaths* compressed and keeled, striate, closely fitting above with a tendency to fall from the culm below, glabrous or rarely hairy, densely and shortly ciliate on the margins ; *ligule* reduced to a dense fringe of hairs.

Inflorescence an oblong, ovate or lanceolate panicle up to 15 cm. long, 5–6 cm. broad, consisting of a central axis upon which are arranged, singly, racemes of spikelets ; axis rather slender, straight, angled, scaberulous or smooth, beset sparsely with white hairs or almost to quite glabrous ; racemes up to 4 cm. long, consisting of shortly ped.celled spikelets seated on a very slender slightly flexuous rhachis, which is hairy or glabrous, scabrid or smooth ; most spikelets subtended by a flexuous scabrid bristle. *Spikelets* oblong or elliptic-oblong, obtuse, plano-convex in profile, 2·5–3 mm. long, curiously like spikelets of *Brachiaria ramosa*. *Lower glume* orbicular or broader than long, 0·6–0·75 mm. long, with very broad hyaline margins, 3-nerved ; *upper glume* as long as or almost as long as the upper floret, broadly elliptic, rounded at the apex, broadly hyaline in the margins, 5–(7) nerved, smooth and glabrous. *Lower floret* barren ; *lemma* elliptic-acute in outline, broadly elliptic-ovate when flattened, smooth and glabrous, 5-nerved ; *palea* hyaline as long as but much narrower than the lemma. *Upper floret* ♀ ; *lemma* crustaceous or chartaceous, definitely rugose, elliptic or oblong-elliptic in outline ; *palea* of the same texture ; *stamens* 3 ; *anthers* 1 mm. long ; *styles* 2 ; *stigmas* plumose, as long as the styles.

Ind. Or. : Bengal ; Darjeeling, 1800 m., 10 Sept. 1874, *C. B. Clarke* 22136A ; Calcutta Bot. Gardn., 11 March 1874, C. B. Clarke 21503.
Madras ; Ramandrug, Bellary, 8 Oct. 1919, *Bourne* ? ; Malabar Taliparamba, Jan. 1906. *Bourne* ?.
Uttar Pradesh ; Dehra Dun, 14 Sept. 1888, *J. F. Duthie* 7736 ; ibidem, Oct. 1890 idem 10757 ; ibidem, Sept. 1899 *idem* 23069 ; and several other sheets.
Northwest India ; Dharamsala, 1500 m., 21 Sept. 1896, *G. A. Gammie* 18652 ; Kangra, Dadh, 1200 m., 20 Oct. 1936 *R. N. Parker* ; *Wingate*.
Bombay ; Mount Abu, Usrot, 27 Oct. 1916, *Blatter* 2503, 2639, 2659, 2721.

This is a very common grass in Tropical Africa.

NOTES ON ASIATIC GRASSES : XXII.

Trikeraia Bor, a new genus of Stipeae.

N. L. Bor

In a paper entitled, "*Stipa hookeri* Stapf", published in the Kew Bulletin, 1950, 319 (1951), the writer of this note drew attention to the unique features of the spikelet of this species and indicated that its inclusion in the genus *Stipa* was anomalous. After a lapse of four years, a serious consideration of the tribe *Stipeae* and its genera has led to the conclusion that this species, while its inclusion in the *Stipeae* is not unwarranted, cannot be regarded as a true *Stipa* without altering unreasonably the taxonomic limits of that genus. Similar arguments could be put forward against placing it in any of the existing genera of the tribe. The creation of a new genus, therefore, to include this very characteristic species seems to be the only reasonable solution of the problem. The name proposed for this new genus is *Trikeraia* from the Greek words τρι stem of τρεῖς, three, and κεραία, horn ; the combination having reference to the awn and two stout horns at the tip of the lemma.

This species is unique in the *Stipeae* by reason of the structure of its lemma. This organ in *Trikeraia* is hyaline in texture, and while it does embrace the palea and the flower, does not become indurated, as in the true species of *Stipa*. Moreover, the lemma possesses a median awn, but in addition the lateral nerves are produced on each side of the awn into two rather stout, scabrid bristles, a character which separates it from all other genera included in the *Stipeae*.

Trikeraia *Bor*

Trikeraia *Bor*, genus novum *Graminearum* ; tribus *Stipearum*.

Spiculae paniculatae, pedicellatae, elliptico-acutae, aristatae ; anthoecium singulum ; rhachilla brevissima, supra glumas disarticulans, haud producta. *Glumae* aequales, plus minus similes, spiculis aequilongae, membranceae, 3-nerves. *Anthoecium* hermaphroditum ; *lemma* oblongo-ellipticum, 5–7-nerve, dorso pilis longis albis pilosum, apice fissum, arista scabra e fissura emergente praeditum ; lobis lateralibus in setas validas scaberrimas productis ; *palea* hyalina, 2-nervis, dorso pilis similibus obtecta : *stamina* 3 ; *antherae* longae ; *styli* 2, breves ; *stigmata* plumosa ; *lodiculae* magnae, 3 ; *caryopsis* non visa.

Gramina perennia rhizomatosa ; *culmi* robusti, erecti, paucinodes ; *laminae* involutae, setaceae, demum subplanae, sulcatae ; ligulae membranaceae ; paniculae contractae vel effusae, breve- vel longe-ramosae.

Species unica, montium tibeticorum incola.

Typus generis *Stipa hookeri* Stapf in Herb. Kew.

Trikeraia hookeri (*Stapf*) *Bor*, comb. nov.

Stipa hookeri Stapf in Journ. Linn. Soc. Bot. **30,** 120 (1894).

Timouria aurita Hitchc. in Jour. Wash. Acad. Sci. **23,** 134 (1933).

Trikeraia hookeri (Stapf) Bor.

1, Plant × ½; 2, ligule × 8; 3, spikelet from side × 5; 4, floret × 5; 5, floret from back × 5; 6, lower glume × 5; 7, upper glume × 5; 8, lemma from inside × 5; 9, palea from inside × 5; 10, lodicules × 6; 11, stamens × 8; 12, gynaeceum × 8.

Gramen perenne radicibus crassis atque rhizomatosis, cataphyllis striatis glabris coriaceis nitentibus impendentibus obtectis. *Culmi* usque 70 cm. alti, glabri, laeves vel minutissime scabri, basi vaginis vetustis coriaceis obtecti ; innovationes intravaginales. *Foliorum laminae* valide involutae, setaceae, demum planae, lineares in apicem validum longe attenuatae, pallide virides vel glaucae, 10–35 cm. longae, 5 mm. latae, supra minutissime scaberulae, infra laeves, marginibus scabrae ; culmorum vaginae internodiis longiores, complectentes, minutissime retrorse scaberulae, striatae, glabrae ; inferiores et eae innovationum laxae, explanatae, coriaceae, striatae, persistentes ; *ligula* brevis, membranacea vel chartacea, circa 2 mm. longa, superne irregulariter lacerata, minutissime ciliata.

Panicula contracta vel effusa ; rami breves vel longi (ei var. ramosae usque 15 cm. longi) infra mediam partem nudi, scaberuli ; pedicelli breves scaberuli. *Spiculae* anthesi hiantes, pallide purpureae vel virides, dense aggregatae, circa 8 mm. longae. *Gluma inferior* 8 mm. longa, explanata 2–2·5 mm. lata, elliptica vel elliptico-lanceolata, 3-nervis, superne compressa, carinata, inferne dorso rotundata, dorso minute scaberula, carina scabra. *Gluma superior* 7·5 mm. longa, explanata 1·75–2 mm. lata, anguste elliptico-acuta, 3-nervis, dorso scaberula, inferne rotundata, superne carinata ; *rhachilla* supra glumas disarticulans. *Anthoecium* hermaphroditum ; *lemma* callo obliquo glabro, paleam complectens, 8·5 mm. longum (setis 3–4 mm. longis inclusis) explanatum elliptico-oblongum, 5–7-nerve, nervis duobus lateralibus anastomosantibus et in setas validas scabras 3–4 mm. longas productis, dorso pilis longis albis usque 2 mm. longis obtectum ; *arista* 14–15 mm. longa, scabra, basi haud torta ; *palea* stamina complectens, anguste elliptico-acuta, 6·5–7 mm. longa, 2-nervis, dorso pilis longis obtecta ; *stamina* 3 ; *antherae* 4–4·5 mm. longae ; loculi in cornua brevia nuda producta ; *styli* 2, brevissimi ; *stigmata* plumosa ; *lodiculae* 3, oblongo-acutae, 1·5 mm. longae.

var. **hookeri**

India : Kashmir, Kugzil, Rupshu, 4,300 m., 16 Jul. 1931, *Koelz* 2328.

Tibet : Probably in the vicinity of Lhasa. July–Sept. 1891, *Thorold* 124 (Typus in Herb. Kew.).; East Tibet, 5,300 m., 20 Jul. 1905, *Younghusband* 113 ; Tinkye Plain, Mt. Everest Expedition, 16 July 1933, *E. O. Shebbeare* 104.

var. **ramosa** *Bor*, var. nov. a var. *hookeri* ramis usque 15 cm. longis recedit.

Tibet : Nye, Tsangpo Valley, 3900 m., 2 Sept. 1935, *F. Kingdon-Ward* 12295—amongst bushes, in meadows and sheltered places (Typus in Herb. B.M.).

Melandrium

In Kew Bull. 1954, 411, a new species was named *Melandryum syngei*. Owing to a misunderstanding and an oversight the spelling *Melandryum* was adopted and not *Melandrium*. The proposal to replace *Melandrium* by *Melandryum* was rejected prior to the 8th International Botanical Congress in Paris 1954 and the rejection (not the proposal) was apparently accepted at Paris. Further, Roehling's *Melandrium*, can be dated from his Deutschl. Fl. ed. 2, vol. 2, p. 37 (1812) here there is a generic key including this genus and from this key a partial description can be prepared. On p. 274 of the same work two species are named and these, though not the genus, are there shortly described.

W. B. Turrill.

A Correction

The description of a new Indian species of *Deyeuxia* appeared in Kew Bull. **1954,** 497 (1954) and was given the name of *D. hackelii* Bor. The specific name *hackelii* is invalidated by *D. hackelii* Parodi in Rev. Argent. Agron. **20,** 14 (1953) and therefore the species needs a new name which is given below.

Deyeuxia kashmiriana *Bor* nom. nov.

D. hackelii Bor in Kew Bull. **1954,** 497 (1954) non Parodi (1953).

N.L. Bor

FERNS AND FERN ALLIES : MISCELLANEOUS NOTES.

F. Ballard

Ctenitis nephrodioides (*Bak.*) *Ballard*, comb. nov.

Deparia nephrodioides Bak. in Gard. Chron. 1872. 253 (1872) ; Hook. & Bak., Syn. Fil. ed. 2, 463 (1883) ; Hook. Ic. Pl., t. 1608 (1886) ; Benth., Flor. Austr. **7.** 714 (1878).

Davallia nephrodioides (Bak.) F. Muell., Fragm. **10.** 104 (1877).

Dicksonia nephrodioides (Bak.) F. Muell., Cens. Austr. Pl. **1.** 137 (1882).

Dryopteris decomposita (R. Br.) O. Ktze. var. *nephrodioides* (Bak.) W. W. Watts in Proc. Linn. Soc. N.S. Wales **37.** 3. 397 (1913).

D. nephrodioides (Bak.) Watts in op. cit. **39.** 259 (1914), non (Hook.) O. Ktze. (1891) nec (Kl.) Hieron. (1907).

It is difficult to understand how Baker could have so misinterpreted the sorus of this fern from Lord Howe Island as to place it in the genus *Deparia*. The sorus is a typical dryopteroid one with a reniform indusium of the usual type though its position at the extremity of a suboblong marginal tooth gives it perhaps a slightly davallioid appearance. Mueller himself, by reason of this fact, placed it respectively in *Davallia* and *Dicksonia*.

The details of the sori given in Hooker's Icones, t. 1608, are particularly poor and the artist has omitted to show the indusium though in the text it is erroneously described as " profunde bivalvi ".

C. Christensen, who correctly transferred the species to *Dryopteris* sens. lat., linked it doubtfully with *D. decomposita* (R. Br.) O. Ktze. (Ctenitis decomposita (R. Br.) Copel.), to which it is almost certainly related. Even Baker in his original description, mentions the close resemblance between the two species, but apparently regarded the similarity as fortuitous.

Ctenitis apicalis (*Bak.*) *Ballard*, comb. nov.

Nephrodium apicale Bak., in Hook. & Bak., Syn. Fil. 499 (1874).

Aspidium apicale (Bak.) Benth., Flor. Austr. **7.** 758 (1878).

Dryopteris apicalis (Bak.) O. Ktze., Rev. Gen. Pl. **2.** 812 (1891).

This species, also peculiar to Lord Howe Island, appears to be closely related to the foregoing but the sori are not borne at the extremity of marginal teeth though in other respects the species are very similar. According to W. W. Watts, this species is rare and he was unable to find it during several excursions he made to different parts of the island.

Diplazium proliferum (*Lam.*) *Kaulf.*, Enum. Fil. 182 (1824).

Asplenium proliferum Lam., Encycl. Méth. Bot. **2.** 307 (1786).

The authority for this species in the genus *Diplazium* was attributed by C. Christensen in his Index Filicum (1906) to A. du Petit-Thouars with the reference " Fl. Trist. d'Ac. 35. 1804 ". This particular flora appears not to have been published separately but is one of the several papers appearing in Thouars' " Mélanges de Botanique " which appeared

in 1811. The date, 1804, given by Christensen, is apparently incorrect as there is no evidence that it appeared before 1811 though the paper is said to have been read before the " Institut " in 1803.

However, there is no reference whatever on page 35 to *Diplazium proliferum* nor indeed on any other page in the work. This is scarcely surprising since the species does not occur on Tristan d'Acunha. How then has the confusion arisen ? In fairness to Christensen it should be stated that he did not see a copy of Thouars' work during the compilation of the Index but obtained the information from some other source, possibly from Kuhn's Filices Africanae (1868).

Kuhn, in fact, seems to have been the first author to cite Thouars in this connection since Sprengel in Syst. Veg. ed. 16 (1827) correctly attributes the combination to Kaulfuss, as does J. Smith in Ferns Brit. & For. (1866). Desvaux in Mém. Soc. Linn. Paris 6. 2. 171 (1827) must have been unaware of Kaulfuss' work of three years earlier since he remakes the combination in his own name.

As Thouars continues to be quoted as the author of *Diplazium proliferum* (Lam.) by modern writers an attempt was made to discover whether the combination had been made by Thouars in some other context. A close examination of the various papers in the " Mélanges " provided an answer.

One of the papers in the " Mélanges " is entitled " Observations sur les plantes qui croissent dans les îles de France, de Bourbon et de Madagascar " with the alternative title of " Observations sur les plantes des Iles australes d'Afrique ". It is addressed to M. de Lamarck and is written in the first person throughout and consists of comments on the first three volumes of Lamarck's Encyl. Méth. The plants discussed are arranged as in Lamarck's dictionary by their vernacular names and on page 35 below the heading " Doradille ; Asplenium L. " appears the following " . . . . . Il y a une variété de la *Doradèlle prolifère*, qui est bipinnatifide et beaucoup plus grande. La *Doradille prolifère* est maintenant un *Diplazium* ".

The last sentence is, of course, the significant one. It indicates that Thouars recognised *Asplenium proliferum* Lam. as a *Diplazium* though he failed to make the necessary new combination.

This is evidently the explanation of the confusion. Thouars was the first to recognise Lamarck's *Asplenium* as a *Diplazium* but a new combination by inference cannot be accepted as effective publication. The correct citation should be *D. proliferum* (Lam.) Kaulf., Enum. Fil. 182 (1824).

For those who would follow Copeland in absorbing *Diplazium* into *Athyrum*, the epithet " *proliferum* " is not available in *Athyrium* by reason of *A. proliferum* Moore (1866) based on a Ceylon plant. Christensen cites it in italics but it is validly published and adequately described.

Adiantum veitchianum *Moore* in Gard. Chron. 1868. 1090 (1868).

The epithet of this Peruvian fern was rejected by C. Christensen in his Index Filicum (1906), page 30, and *A. microsorum* C. Chr. substituted, apparently because he regarded Moore's name as an orthographic

variant of *A. veitchii* Hance from Japan and China, or more likely perhaps to avoid confusion between the two similar epithets. However, they are not orthographic variants and Moore's original name must stand.

Notholaena tricholepis Bak. in Journ. Bot. **21.** 245 (1883).

The type of this species collected by J. Hannington in central Tanganyika is **N. inaequalis** *Kunze* and is a good match of Kunze's figure in Die Farrnkrauter, t. LXIV.

Marsilea polycarpa *Hook. & Grev.*, Ic. Fil. **2.** t. 160 1829 .

This species, which up to 1947 had always been regarded as exclusively tropical American and Tahitan, was discovered by Mr. J. H. Hinds in the Northern Territories of the Gold Coast at Brufo near Lawra. It was found in muddy pools overlying laterite at an altitude of 1000 feet. Mr. C. D. Adams recollected it at the same locality in 1951.

Mohria caffrorum (*L.*) *Desv.* var. **vestita** Bak., Ballard, comb. nov.

M. vestita Bak. in Trans. Linn. Soc. Bot. 2nd ser., **2.** 355 (1887) ; Hook., Ic. Pl. t. 1696 (1887).

J. G. Baker distinguished his species from *M. caffrorum* by its copious investiture of scales. The type specimen collected by H. H. Johnston on Mt. Kilimanjaro is certainly very scaly, much more so than in typical *M. caffrorum*, but in other respects agrees with it. There is, in any case, great variability within *M. caffrorum* itself and *M. vestita* would seem to merit little more than varietal rank. It is, perhaps, significant that no other specimen of *M. vestita* has ever been received at Kew.

Adiantum martinii Pirotta in Ann. Ist. Bot. Roma **8.** 15, t. 12A 1903 .

This species, described from material collected in Eritrea and Abyssinia, is identical with **A. balfourii** *Baker* in Ic. Pl. t. 1630 1886 described from specimens collected in Socotra.

Shrubs for the Rock Garden and Alpine House.*—The author has specialised in the cultivation of shrubs and dwarf trees for many years. As a result of his experience he presents in this book much useful information on growing plants for the rock garden and alpine house, and describes over 130 genera and several hundred species.

Following the foreword the book is divided into two parts, one dealing with cultivation, the other giving lists of the dwarf conifers and shrubs. The book is illustrated with line drawings and many photographs, and will be read with interest by those who cultivate these plants.

H. S. MARSHALL.

* Shrubs for the Rock Garden and Alpine House. By Roxton E. Heath. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 1954. Pp. 191. 6 line drawings and 54 photographs. Price 42/-.

John William Bews.*—It is pleasing to welcome the appearance of this well written account of the life and work of the late Prof. Bews, one of the leading plant ecologists of the present century. The book is the work of a former student, Dr. G. W. Gale, now Dean of the Faculty of Medicine in the University of Natal, with the assistance of Mrs. Bews, Prof. Bayer and various other collaborators. It was General Smuts, with whom Bews had always been on very friendly terms, who first suggested that there should be some permanent record of Bew's life and work. Both men were keenly interested in the varied vegetation of southern Africa and shared a special interest in the grasses and grasslands of the country.

The son of an Orkney farmer Bew's early life was not without hardship and difficulties, including periods of ill health. By winning scholarships he made his way through the University of Edinburgh and achieved the distinction of graduating in both arts and science. He arrived in Natal in 1910 as the first Professor of Botany at the newly established University College at Pietermaritzburg. Fortunately the sunny climate of South Africa brought about a marked improvement in his health. He lost no time in applying himself vigorously to the ecological studies that were later to yield such fruitful results.

Bews not only excelled as a botanical research worker but also as a stimulating teacher and later as a university administrator. He was in fact one of the founders of university education in Natal. Many of the students who passed through his hands in the 1920's later became well known in botanical and educational spheres in South Africa. At the present time a third of the professorial posts in botany in the country and the four highest posts in the State botanical services are occupied by his former students.

F. N. Howes.

* John William Bews. By Dr. G. W. Gale. University of Natal Press, Pietermaritzburg. 1954, Pp. V + 140, Pls. 6. Price 15s. net.

Practical Gardening.*—This is the fourth edition of a useful book still very much in demand. Its purpose we are told in the foreword is " to provide an introduction to gardening ; a simple summary of garden craft for the reader with little or no practical experience ".

The edition before us fulfills this purpose very thoroughly. It has been revised and brought up-to-date and deals with garden operations in a clear manner. Indeed from cover to cover it is full of practical advice, hints and suggestions which all amateur gardeners may read with profit. The value of the book is greatly increased by the many excellent photographs and line drawings.

H. S. Marshall.

* Practical Gardening for Amateurs. By A. G. L. Hellyer. London : W. H. & L. Collingridge Ltd. New York : Transatlantic Arts Inc. 4th edition, 1954. Pp. 298. Price 15/-.

THE PODOCARPS OF EAST AFRICA.

R. Melville

Species in the genus *Podocarpus* are difficult to discriminate owing to their great vegetative similarity and the very gradual change from the juvenile to fully adult foliage extending over many years. This gives rise to the danger of confusing the leaf forms of one stage of one species with those of a different stage of another species. In an endeavour to resolve these difficulties for the Flora of Tropical East Africa, a study has been made of the leaf spectra, the bud scales, the bark and slash and the microsporophylls and pollen as well as the female reproductive structures on which most reliance has hitherto been placed.

Two sections of the genus are represented in East Africa. The section *Afrocarpus* Buchholz and Gray of the subgenus *Stachycarpus* Engler is distinguished by the presence of stomata on both surfaces of the leaf and a scarcely differentiated receptacle, which never swells when the fruit ripens. This includes *P. gracilior* Pilger, *P. usambarensis* Pilger and *P. dawei* Stapf. The subgenus *Protopodocarpus* Engl. is represented by the section *Eupodocarpus* Endl. in which are placed *P. milanjianus* Rendle, *P. ulugurensis* Pilger and the new species *P. ensiculus* Melville, described below. These are distinguished by the leaves bearing stomata on the lower surface only and by the presence of transverse hypodermal fibres in the leaf, which can be seen as a mat with projecting fibres when a leaf is torn in half. The receptacle of the fruit is well developed, more or less swollen and either leathery or fleshy in substance.

Podocarpus milanjianus Rendle is a large tree reaching 35 m. in height, widely distributed in the montane forests of Tanganyika, Kenya and Uganda and extending southward through Nyasaland into the Chimanimani Mts. in Southern Rhodesia, northward to the Imatong and Didinga Mts. in Sudan and westward to the Virunga Mts. in the Belgian Congo. Robyns also reports it from Mt. Bambutta in Cameroon. The outer bark is brown or liver coloured to grey brown, about 1 mm. thick, exfoliating in papery flakes, or to 3 mm. thick with longitudinal furrows 5–25 mm. apart. The inner bark is tough and fibrous, 3–5 mm. thick ; the slash is pale brown. The leaves vary considerably in size and shape. Juvenile leaves attain to 20 cm. in length, and 13 mm. breadth, are linear lanceolate, gradually tapering to the tips and rather abruptly at the base, with a short petiole. As the tree ages the leaves become smaller, about 8 cm. long, 6 mm. broad, linear and taper gradually in the upper fifth to an acute point. The final stages in the sequence are seen in old trees growing on exposed ridges, where the stature may be reduced to a few metres and the leaves to 2–3 cm. long and 5 mm. broad. They are then linear elliptic in shape, tapering abruptly to an acute almost spiny point, the texture becomes coriaceous and the margins enroll to some extent, when the leaves are dried.

Pilger (Pflanzenreich, **4** (5), 92, 1903) erected two forms of *P. milanjianus :* f. *arborescens*, a large tree with gradually tapering leaves and *f. typica*, shrubby with shorter more abruptly tapered leaves. It is clear, by reference to the specimens cited, that these represent only different growth phases as individuals of the species pass from youth to old age, as described above. They are of no taxonomic value.

It is convenient to refer here to *P. ulugurensis* Pilger (Notizbl. Bot. Gart. Mus. Berlin, **12,** 82, 1934), since it has been maintained on a leaf character. The species was based on a single male specimen from Magali on the Uluguru Mts., Tanganyika. The description brings to light no differences to separate it from *P. milanjianus*. Gray, however, in her revision of *Podocarpus* (Journ. Arn. Arb., **34,** 164, 172, 1953) separates it on the presence of 5 vascular resin canals in the leaf and the grooved upper midrib. *P. milanjianus* in addition to the marginal resin canals, normally has three associated with the vascular strand of the leaf. Fortunately my colleagues Messrs. R. B. Drummond and J. H. Hemsley on their expedition to East Africa in 1953 had been able to obtain abundant material of the podocarps of the Uluguru Mts. Their numbers 1612 from the Salaza Forest and 1767 from Bondwa Hill proved to be of special interest. Both were females with fruit, leaving no doubt of their assignation to *P. milanjianus*. Transverse sections were prepared from several leaves of each. Some from each plant had the usual three vascular resin canals of *P. milanjianus*, one leaf of No. 1612 had 5 resin canals associated with the vascular tissue, while another had 5 vascular resin canals and two others widely spaced in the mesophyll on either side of the midrib, in addition to the marginal canals. Leaves of No. 1767 were found with 7 and 11 resin canals additional to the marginal canals. It was noticed that when resin canals occurred in the mesophyll, the position of these could be observed in the intact leaves by the presence of faint longitudinal ridges. When there were only two additional resin canals closely approximated to the vascular strand, the result was a channel along the midrib on the upper surface, which was a character adduced for *P. ulugurensis*. Having discovered the macroscopic evidence for the presence of supernumerary resin canals, the available material of *P. milanjianus* was scanned to determine whether this condition was confined to the podocarps of the Uluguru Mts. It was found, among others, in Greenway 4899 from the E. Usambaras, Burtt 1345 from the Kondoa District and Uhlig 1101 from Kilimanjaro, all in Tanganyika and from the Virunga Mts., Belgian Congo, in Burtt 3158 and 3169. The character appears sporadically over most if not all of the range of *P. milanjianus* and occurs in trees of all ages and stages of development. Usually only a small proportion of the leaves of a tree are affected. The presence of supernumary resin canals in the leaves in *P. milanjianus* is evidently an abnormality with no taxonomic significance and *P. ulugurensis* Pilger is no more than a transient state of that species.

It is not always easy to distinguish between detached vegetative shoots of *P. milanjianus* and *P. ensiculus*, but there are differences between the bud scales, as well as in the reproductive structures. In *P. milanjianus* the leaves spread stiffly from the branches and the outer bud scales of terminal buds are linear, gradually tapering to an acute tip. Successive scales inwards are shorter and more triangular, passing to triangular ovate with a broad triangular stiff tip, then to suborbicular with stiff triangular tip and orbicular with short stiff rounded tip. (Fig. 1, h–n). The margins of the intermediate scales are scarious and denticulate, but usually not brown, although there may be a narrow brown zone away from the margin. The scales from the base of the male cones are different (Fig. 1, a–e), the intermediate ones being most characteristic. These are suborbicular, more or less scarious with a conical or dome shaped apex

beyond which the scarious denticulate margin extends. The transition to fertile scales is abrupt and median microsporophylls with their two bulging pollen sacs are broadly elliptic in outline, the length of the pollen sacs being about 1·8 mm. and the breadth across the pair 1·5 mm. The apical lobe is semi-circular to semi-elliptic, with denticulate margin (Fig. 1, g). *P. ensiculus* has the leaves more or less pendulous and the bud scales with brown scarious margins.

FIG. 1. *Podocarpus milanjianus* Rendle : a–e bud scale spectrum from mature male strobilus, a outermost, d innermost scale, e transitional fertile scale, f median microsporophyll, upper surface, g tips of median sporophylls ; h–n bud scale spectrum from terminal bud of average lateral branch, h outermost, n inner bud scale, a–g from Purseglove No. 347, Ruwenzori (Scale A) ; h–n from Drummond and Hemsley No. 1767. Bondwa Hill, Uluguru Mts. (Scale B).

When this investigation started, there was some evidence from incomplete herbarium specimens and from reports of foresters that an undescribed species of *Podocarpus* occurred in the Western Usambara Mts. This was at times confused with *P. usambarensis* on account of its large seeds and at others with *P. milanjianus* from the size of the leaves. Material obtained by Messrs. R. B. Drummond and J. H. Hemsley on

their expedition to East Africa in 1953 and specimens supplied by Mr. G. R. Williams now confirm the presence of a new species, which is described below.

Podocarpus ensiculus *Melville*, sp. nov. *P. henkelii* Stapf affinis sed fructus amplior et forma squamorum strobili masculini et feminei distinctus.

Arbor usque 30 m. alta, cortice cinereo-brunneo tenue, foliis ± pendulis linearibus rectis vel falcatis apicibus sensim acuminatis, 6–21 cm. longis, 3–10 mm. latis. Perulae internae rotundae marginibus scariosis brunneis in apices acutos contractae. Strobili masculi singulatim axillis foliorum ; strobili feminei saepe squamis 2 ovuliferis unicis maturis. Fructus maturus viridis vel subflavus, ovoideus vel oblique ellipsoideus, 24–35 mm. longus, 18–28 mm. diametro, putamine nunquam lignoso, 4–9 mm. crasso, multis lacunis usque 3 mm. latis latice albo praedito. Receptaculum squamis 2–4, siccis nunquam carnosis, pedicello glabro 2–5 mm. longo.

Tanganyika : Western Usambaras, Lushoto District : Matondwe Hill at head of the Kwai Valley, 2000 m., R. B. Drummond and J. H. Hemsley No. 1340, Feb. 28, 1953 (Typus, in Herb. Kew.) ; Matondwe Hill, G. R. Williams, G. 513 ; S.W. Shagai forest, 2 km. S.E. of Sunga, 1950 m., Drummond and Hemsley 1410 ; W. Shagai forest, 2000 m. seedlings, Drummond and Hemsley 2562 ; Shagai forest, M. G. Parry, 203 ; Magamba Forest Reserve, nr. Gologolo, M. G. Parry, 179, 180.

A tree up to 30 m. high, with the trunk to 1½ m. diameter, outer bark grey brown, 1–3 mm. thick, fibrous with shallow longitudinal fissures 1–2 cm. apart ; inner bark tough, fibrous 3–5 mm. thick ; slash pinkish red immediately under the outer bark paling inwards. Branchlets pale green, 2–5 mm. diameter, with decurrent grooves from the leaf bases. Terminal buds of average branches with the outer bud scales strap shaped tapering to a linear tip, successive scales inwards rapidly changing shape to the inner rounded scales abruptly contracted into a slender sharp tip and having prominent brown scarious margins (Fig. 2, p–t). Leaves of adult trees, spirally arranged, moderately crowded 6–21 cm. long, 3–10 mm. wide, linear, tapering to the base and very gradually to the acuminate tip, straight or slightly falcate and more or less pendulous, midrib almost flush above and keeled below at the base, torn leaf showing transverse fibres in the mesophyll ; stomata on the lower surface only. Seedling with two linear, blunt cotyledons 3–5 cm. long, 1·2 mm. wide, first year leaves 6–10 cm. long, 7–11 mm. wide, linear lanceolate, the first few pairs opposite. Male cones solitary in the leaf axils, about 2 cm. long, probably lengthening to about 4 or 5 cm., median fertile scales with 2 pollen sacs about 2·0–2·2 mm. long and breadth across the pair about 1·2 mm., terminated by rounded triangular lobes with irregularly dentate margins (Fig. 2, f), successive budscales of the cone changing from the base inwards from narrowly triangular, keeled, to scales with a short base and a rounded scarious limb terminated by a narrow triangular flexible tip, to rounded scarious scales with an erect deltoid tip, to the innermost rounded scarious scales without a distinct tip (Fig. 2, a–e). Female cones singly in the leaf axils, frequently with two scales bearing an ovule, of

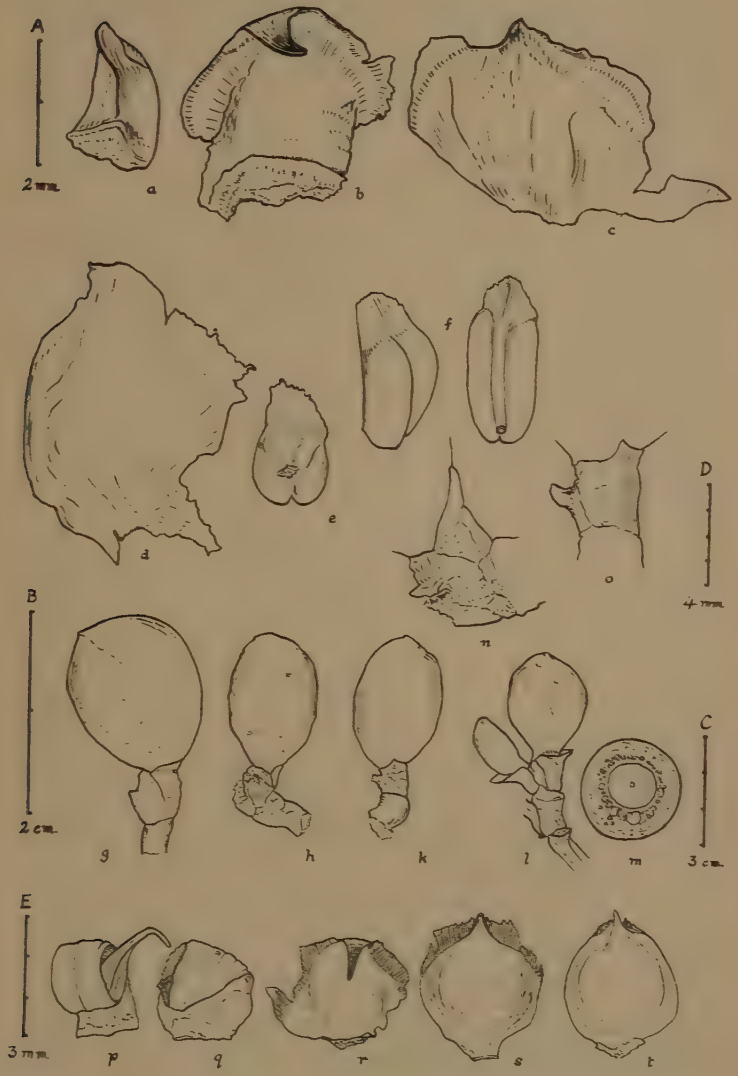

FIG. 2. *Podocarpus ensiculus* Melville : a–e bud scale spectrum from mature male strobilus. a outermost, d innermost scale, e transitional fertile scale, f median microsporophylls, all scale A ; g–o seeds. g mature, h–l immature seeds Scale B . m transverse section of mature seed Scale C . showing zone of gum pockets and absence of a woody sclerotesta. n–o receptacles Scale D , n of seed b. o of seed k ; p–t bud scale spectrum of terminal bud of average lateral branch Scale E . p outermost, t inner bud scale. a–o from Drummond and Hemsley No. 1410, Shagai Forest ; p–t from Drummond and Hemsley No. 1340, Matondwe Hill, W. Usambara Mts.

which only one reaches maturity. Young fruit blue glaucous, mature fruit (Fig. 2, g) grass green or tinged with yellow, ovoid to obliquely ellipsoid and slightly pointed, 24–*30* 35 mm. long, 18–*24*–28 mm. diameter, the shell never woody, 4–9 mm. thick, containing, especially to the inner side, numerous cavities up to 3 mm. wide containing a white milky fluid or a gum deposit (Fig. 2, m). Receptacle 4–5 mm. long, 2–3 mm. wide, of 2–4 warty scales remaining hard and not becoming fleshy (Fig. 2, n o), borne on a smooth scaleless pedicel 2–5 mm. long. The epithet *ensiculus*, meaning a small sword or rapier, is bestowed in reference to the leaves.

Although most closely related to the South African *P. henkelii*, in E. Africa *P. ensiculus* is, in the absence of fruits, most likely to be confused with *P. milanjianus*. From that species it differs in the more or less pendulous leaves, which are more slender at corresponding growth phases, in the bud scales and in the male catkins, as well as in the more obvious characters of the seeds and receptacle. The terminal bud scales are more flexible than in *P. milanjianus*, the outer scales often have a slender linear tip, the comparatively broad scarious margin of the intermediate scales is generally clearly visible with a hand lens on account of its brown colour and the tips of these scales are flexible, not stiff, while the tips of the inner scales are more slender. The intermediate scales at the base of the male cones have a thin triangular apex, the conical or dome shaped apex of *P. milanjianus* not developing. The microsporophylls have pollen sacs about 2·0 mm. long and 1·2 mm. in breadth across the pair, the outline being narrowly elliptic instead of broadly so. The outer bark is distinctly fibrous, tending to pull off in long strips, instead of flaking in thin angular papery fragments.

The three small leaved podocarps of East Africa, *P. gracilior* Pilger, *P. usambarensis* Pilger and *P. dawei* Stapf are closely related to one another and to *P. falcatus* (Thunb.) R. Br. of South Africa. The relationship is so close that Robyns (Bull. Inst. Roy. Colon. Belge, **6,** 237, 1935) suggested that all four might prove to be geographical varieties of a single species. In that event the name *P. falcatus* would take precedence. Pilger in his monograph of the Taxaceae (Engl. Pflanzenreich **4** (5), 1903) separated *P. falcatus* from *P. gracilior* by the smaller male cones and blunt cone scales of the former. Investigation has shown that this is a valid distinction. The male cones are constantly smaller in length and diameter, the individual cone scales are smaller, the terminal lobe is blunt and subentire, not denticulate. In addition, the seeds of *P. falcatus* are constantly smaller, thinner shelled and on more slender peduncles and there are minor differences in the leaves. The association of this group of characters marks off *P. falcatus* as an entity distinct from *P. gracilior* at the specific level. *P. usambarensis* and *P. dawei* are still further removed from *P. falcatus* by their large seeds with thick woody shells, but it is necessary to consider their relationship with *P. gracilior*.

Pilger distinguished *P. usambarensis* from *P. gracilior* by the size of the seed and the thickness of its shell, but this leaves open the possibility that the former is only a large seeded variety of the latter. Chalk, Burtt Davy and Desch (Some East African Coniferae and Leguminosae, 23, 1932) in their key separated *P. usambarensis* from *P. dawei* and *P. gracilior* by the greater length and breadth of its leaves. Gray (Journ. Arn. Arb.

34, 68, 1953) used the same character. Examination of a wide range of material has shown that these trees cannot be distinguished by leaf size. In all three, leaf size ranges from about 18 cm. long and 6 mm. broad in seedlings to 10–15 mm. long and 1·5–2·5 mm. broad in fully adult trees, possibly growing under slightly adverse conditions. Seedlings of all

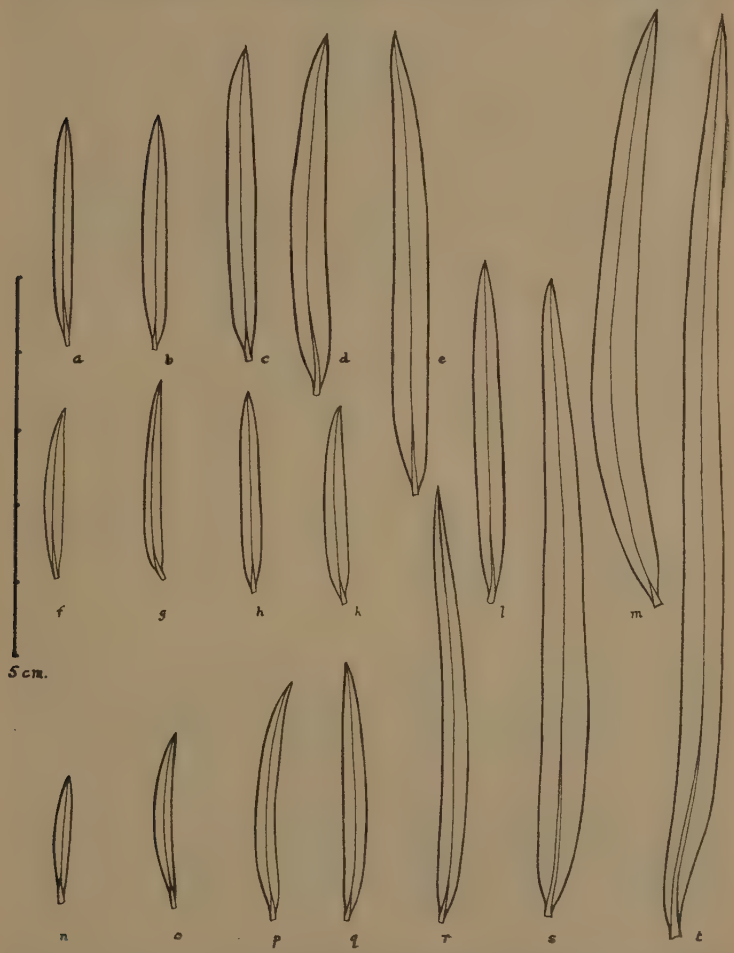

FIG. 3. Ontogenetic leaf spectra represented by the sixth leaf below the apex of average lateral shoots of a–e *Podocarpus usambarensis* Pilger var. *dawei* (Stapf.) Melville, f-m *P. usambarensis* Pilger var. *usambarensis*, n–t *P. gracilior* Pilger. The most juvenile leaves are at the right, the most adult at left.

three have a large proportion of their leaves in opposite or subopposite pairs, although some branches may have them alternate. This character distinguishes seedlings of the small leaved species of East Africa from *P. milanjianus* and *P. ensiculus* in which only the first few leaves of the seedling are paired. The paired leaf character may persist for a number

of years, even in trees 50 ft. high and vigorously reproducing. This appears to occur more frequently in *P. usambarensis* and *P. dawei* than in *P. gracilior*, but whether it is of any value as a field character must await the test of further observation.

Fuller use can be made of leaf characters by the comparison of leaf sequences or leaf spectra as a whole. Here one may distinguish between the current leaf spectrum including all the leaves on a shoot developed in one growth season and an ontogenetic spectrum, or the sequence of shapes observed in leaves from corresponding positions on shoots from plants of various ages from juvenile to full adulthood. It is the protracted ontogenetic sequence that leads to much confusion in *Podocarpus*. Ontogenetic leaf spectra from the three trees under discussion are shown in Fig. 3. The sixth leaf from the apex of average shoots was chosen for illustration, because such differences as exist appeared to be best expressed at this level in the current leaf spectra. Seedling leaves of all three are very similar and for this reason and for considerations of space those of *P. dawei* have been omitted. It will be observed that the gradual tapering of the leaf from some point near the base, characteristic of the juveniles of all, is maintained in *P. gracilior* well into adulthood, but that the position of maximum breadth tends to be about the midpoint in the most gerontic leaves. In *P. usambarensis* and *P. dawei* the leaves tend to become nearly parallel sided early in adulthood and this feature is maintained in the most gerontic leaves available at present. The leaves of *P. dawei* tend to be slightly broader than in *P. usambarensis* and they are commonly contracted rather abruptly near the apex. Although the apex is sometimes abruptly contracted in *P. usambarensis* it is more commonly tapered from a point about $\frac{1}{3}$–$\frac{1}{4}$ of the leaf length below the apex.

The above remarks apply exclusively to the sixth leaf from the apex of shoots. If the current leaf spectra are examined some further differences may be observed. The first one or two leaves at the base of a shoot, i.e. those first developed in the current seasons growth, in *P. gracilior* tend to be more or less parallel sided. In *P. usambarensis* there are several such leaves, which may form about a third of the total number produced in the season, while in *P. dawei* about half to two thirds of the leaves may have this character and only those nearest the apex of the shoot are gradually tapered. The net result is that a *P. dawei* shoot impresses the observer with its preponderance of relatively broad sublinear leaves, a feature that may prove to be a useful field character. By taking the sixth leaf from the apex for illustrating the ontogenetic leaf spectra, such leaves were sampled in *P. dawei*, but not in the other two.

Terminal buds of average lateral shoots are rather small in all three trees. Those of *P. gracilior* are largest with a diameter of up to 2 mm., while those of *P. usambarensis* and *P, dawei* are both about 0·7–1·5 mm. diameter. The bud scale spectra are illustrated in Fig. 4, drawn from representative individual buds. The outer bud scales of *P. gracilior* are narrowly triangular to strap shaped, the intermediate scales are triangular to deltoid with scarious denticulate margins, passing to more rounded scales with only a feebly developed point and finally, more or less scarious rounded scales. *P. usambarensis* and *P. dawei* differ in several respects, but resemble one another rather closely. The outer bud scales

tend to be stiffer and the intermediate scales develop a firm hard pointed apex, while their margins are entire or feebly denticulate.

A number of male specimens of *P. gracilior* were examined and the size of the cones and especially that of the individual fertile scales was found to vary but little. The breadth of the base of the terminal lobe of median microsporophylls was about 1·5 mm. Little male cone material of either *P. usambarensis* or *P. dawei* was available, but this indicates that microsporophylls of *P. usambarensis*, with a terminal lobe measuring about 0·7–0·9 mm. across the base, are considerably smaller than in *P. gracilior*,

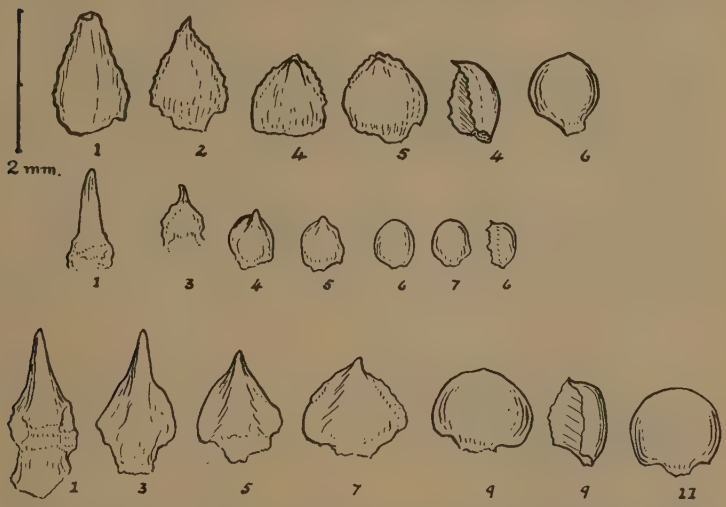

FIG. 4. Bud scale spectra from terminal buds of average lateral shoots : upper row, *Podocarpus gracilior* Pilger from Drummond and Hemsley No. 1266, Kilimanjaro ; middle row, *P. usambarensis* Pilger var. *usambarensis* from Greenway and Parry, No. 8738 ; bottom row, *P. usambarensis* Pilger var. *dawei* (Stapf.) Melville from Drummond and Hemsley No. 4600, Malabigambo Forest, Uganda. The numbers indicate the position of scales in the sequence, outermost at left.

while those of *P. dawei*, with a terminal lobe measuring about 0·9–1·2 mm., are smaller than in *P. gracilior*, though somewhat larger than in *P. usambarensis*. Further material is needed to establish the range of variation. The spectrum of the basal scales of the expanded male cones was examined and found to be similar, in general, for the group, but the basal scales in *P. gracilior* are more sharply triangular and more strongly denticulate than in the other two. (Fig. 5).

The size of the seeds has been regarded as the best criterion for the separation of *P. gracilior* from *P. usambarensis* and *P. dawei*, but even in this, the distinction is not absolute. Measurements made of mature seeds gave the following ranges and approximate means :—

P. gracilior :	length 14–*19*–23 mm.	diameter 11–*17*–21 mm.
P. usambarensis :	length 21–*25*–35 mm.	diameter 19–*21*–30 mm.
P. dawei :	length 19–*25*–28 mm.	diameter 15·5–*22*–27 mm.

Seeds of *P. gracilior* weigh about 180 to the pound and those of *P. usambarensis* about 30–50. No reliable figures are available for *P. dawei*. The seeds vary in shape from ellipsoid to subglobular, but those of *P. gracilior* are more commonly ellipsoid while the other two are usually subglobular. The thickness of the woody shell of the seed runs parallel with seed size. Shells up to 8 mm. thick have been reported in *P. usambarensis* ; I have observed thicknesses of 3–6 mm. (mean about 4 mm.) in *P. usambarensis* ; 2–4 mm. (mean about 3 mm.) in *P. dawei* and 1·0–2·4 mm. (mean about 1·5 mm.) in *P. gracilior*. Average seeds are illustrated in Fig. 6. Surrounding the woody sclerotesta there is always a gum zone shown radially

Fig. 5. Median microsporophylls and bud scale spectra from the base of mature male strobili of row F, *Podocarpus falcatus* R. Br. from Fraser 62 A, Ntsubane Forest ; row G, *P. gracilior* Pilger from Drummond and Hemsley No. 1266, Kilimanjaro ; row U, *P. usambarensis* Pilger var. *usambarensis* from Greenway and Parry No. 8738, Shagai Forest. Usambara Mts. ; row D, *P. usambarensis* Pilger var. *dawei* (Stapf.) Melville from Drummond and Hemsley, No. 4600, Malabigambo Forest, Uganda. Rows F and G—scale A ; rows U and D—scale B.

striated in Fig. 6 e, h, and n. In all three the seeds are borne on short lateral branches 8–25 mm. long, which may be leafy (Fig. 6 a)) but more often are provided at first with scale leaves (Fig. 6 d) which soon fall off and are absent from the mature seed stalks (Fig. 6 b, g, m). The bract subtending the seed is usually sharply deltoid and of thin texture in *P. gracilior* (Fig. 6, c, d, f) but blunter and somewhat swollen in *P. usambarensis* and *P. dawei* (Figs. 6 k, l, o, p).

The barks are greyish brown to dark brown in colour and when dry break with a short, non fibrous fracture. In mature trees of *P. gracilior*

the inner bark is 10–15 mm. thick and the outer bark flakes off in rectangular or irregular flakes up to 12 cm. long and 7 cm. wide and 1–3 mm. thick, sometimes leaving a conchoidal depression. In younger trees the bark is thinner and exfoliates in rectangular flakes often 2–4 cm. long, 1–2 cm. wide and about 1 mm. thick. A mature tree of *P. dawei* had the inner bark 10 mm. thick and the outer bark flaking in small rectangular

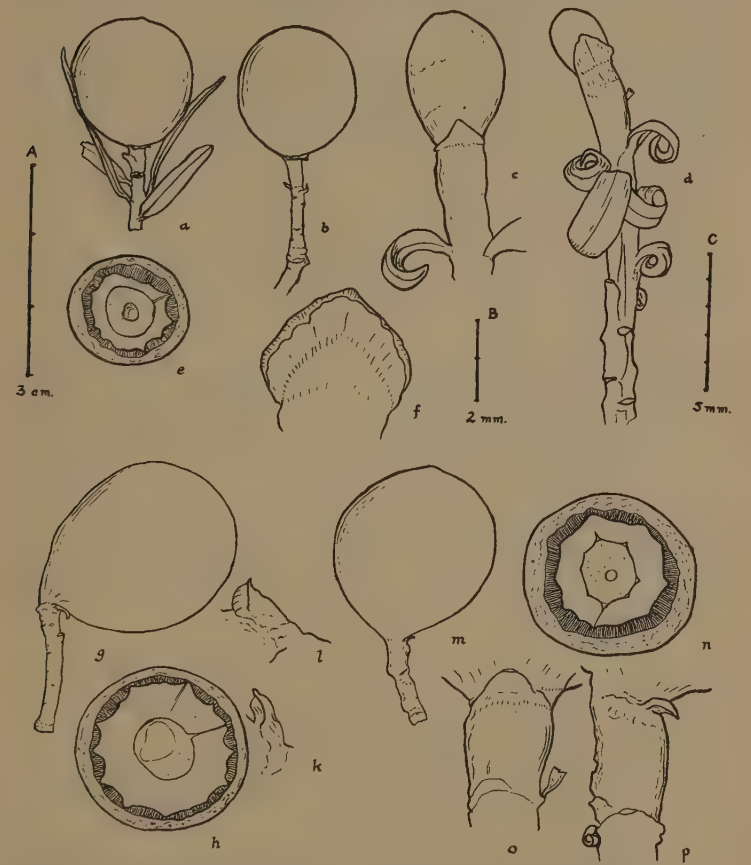

FIG. 6. Seeds of small leaved Podocarps : a f, *Podocarpus gracilior* Pilger from Drummond and Hemsley No. 1266, Kilimanjaro ; a, b, e, mature seeds (Scale A), e section ; c–d, young seeds, two stages (Scale C) ; f, bract of seed b (Scale B) : g–l, *P. usambarensis* Pilger, var. *usambarensis*, from Drummond and Hemsley No. 1371, Shume Forest, W. Usambara Mts. ; g mature seed and h, section (Scale A) ; k bract scale of g, l another bract (Scale C) : m–p, *P. usambarensis* Pilger var. *dawei* (Stapf.) Melville from Drummond and Hemsley No. 4622, Kyebe, Uganda ; m, mature seed and n, section (Scale A) ; o, p, receptacle and bract of m, front and lateral views (Scale C).

or irregular patches 5–15 mm. wide and about 0·5 mm. thick. An adult tree of *P. usambarensis* had the inner bark 8 mm. thick and the outer bark flaking in rectangular pieces 1–3 cm. long, 1–2 cm. wide and 1·0–1·5 mm. thick. Other samples were similar. The slash is reported to be pink in

P. gracilior and *P. dawei*, but pale brown in *P. usambarensis*. There appear to be bark differences between the three trees, but more field observations are needed to determine whether they can be usefully applied.

In this survey of the three small leaved podocarps, *P. gracilior* has constantly shown differences from *P. usambarensis* and *P. dawei* while the two latter have always resembled one another in differing in the same way but to a different degree from the former. There are adequate grounds for maintaining *P. gracilior* Pilger as a species. The other two differ in degree rather than in kind and are best treated as varieties of one species. This must take the name *P. usambarensis* Pilger and *P. dawei* Stapf. must be reduced to varietal rank. Accordingly the new combination *P. usambarensis* Pilger var. *dawei* (Stapf.) Melville is required, based on *P. dawei* Stapf. in Fl. Trop. Africa **6** (2), 342 (1917).

Key to the East African species of *Podocarpus*.

Leaves large, up to 10 cms. or more long, stomata on lower surface only, torn leaf revealing transverse hypodermal fibres, receptacle of seed more or less swollen.

Leaves spreading, nearly parallel sided, tapering in upper $\frac{1}{3}$–$\frac{1}{2}$, receptacle fleshy, red when ripe, seeds 9–12 mm. long with thin flesh and thin hard shell, outer bud scales of terminal buds strap shaped, acute, inner with triangular tip and narrow brown band parallel with the margin . . . . . *milanjianus*

Leaves often pendulous, tapering very gradually from below the middle, receptacle firm, not colouring, seeds 24–35 mm. long, with flesh 4–9 mm. thick and no woody shell, outer bud scales of terminal buds strap shaped with slender linear tip, inner rounded with short sharp tip and broad brown margin . . . . *ensiculus*

Leaves small, mostly 2–5 cm. long, stomata on both leaf surfaces, no hypodermal fibres.

Seeds commonly ellipsoid, 14–*19*–23 mm. long, 11–*17*–21 mm. diameter woody shell 1–2 mm. thick, terminal lobe of middle catkin scales 1·5 mm. broad, leaf apex in adult trees gradually tapered . . . . . *gracilior*

Seeds commonly subglobular, 19–*25*–35 mm. long, 15·5–*22*–30 mm. diameter, woody shell 2–6 mm. thick, terminal lobe of middle catkin scales 0·6–1·2 mm. broad, middle leaves of shoots of adult trees parallel sided, abruptly tapered at the tip . *usambarensis*

Seed shell 3–6 mm. thick terminal lobe of catkin scales 0·7–0·9 mm. broad, Usambara Mts. . . . var. *usambarensis*

Seed shell 2–4 mm. thick, terminal lobe of catkin scales 0·9–1·2 mm. broad, W. of Lake Victoria . . . var. *dawei*

NOTES ON HYPOCREA CITRINA (PERS.) FR., H. LACTEA FR., H. PULVINATA FCL. AND H. SULPHUREA (SCHW.) SACC.

By Joan M. Dingley,

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. With the object of establishing the identity of New Zealand specimens listed as *Hypocrea citrina*, collections in the herbarium, Royal Botanic Gardens, Kew, filed under this species and under *H. lactea* Fr., *H. pulvinata* Fcl. and *H. sulphurea* (Schw.) Sacc., were critically examined. The following descriptions and synonymy are based on examination of authentic material in Kew herbarium.

Hypocrea citrina (*Pers.*) *Fries*, *Summa Veg. Scand.*, **383,** 1849. (*Sphaeria citrina* Pers., *Obs. Myc.* **1,** 68, 1796) ; *Hypocrea pulvinata* Fuckel, *Symb. Mycol.*, **185,** 1870 ; *H. citrina* var. *fungicola* Karst., *Myc. Fenn.* **2,** 204, 1873 ; *H. karsteniana* Niessl. in Rehm *Hedwigia* 22, 53, 1883 ; *H. fungicola* Karsten in Wint. *Rabenhorst's Krypt. Flora*, **1,** ii, 141, 1884.

Stroma pulvinate, usually single and scattered but often fused together to form an effuse mass, single stroma up to 8 mm. diameter, 1 mm. thick, margins incurved and attached to the substratum, pale bay-brown tomentose often with byssoid mycelium, punctate with depressed ostioles of the superficially imbedded perithecia. Stroma tissue beneath perithecia compacted into a pseudoparenchyma but remaining prosenchymatous near the base, mycelium 3–5 μ diameter, hyaline. Perithecia globose, 150–250 μ diameter, ostiole 75–100 μ long, perithecial wall 10–15 μ thick, cells small, 2–4 μ diameter with lightly pigmented walls. Asci cylindrical, 75–120 × 4·5–7 μ, with 16 part-spores uniseriately arranged in the ascus. Spores 2–4·5 × 2–3 μ, hyaline, echinulate unevenly divided, pyriform or oval.

Collections examined in Kew herbarium.

' H. citrina ', Fries Scleromyceti Sueciæ no. 31 (part of Type) (Fig. I, 4)
Karsten, Fungi Fenniae exs. 264.
Haslemere, E. W. Swanton, Oct. 1913.

' H. karsteniana ', Rehm, Ascomycetes 678.

' H. pulvinata ', Fuckel, Fungi Rhenani, 185.

' H. fungicola ', Otto Jaap, Fungi Selecti exs, 31.
Reliquiae Farlowianæ 34.

' H. citrina ' ex Herb. Cke. Isle of Wight, 1879 = *H. argillacea* Phil & Plowr.

Fries (1822) described *Sphaeria citrina* Pers. ex Fr. as ' fleshy effuse flat yellow, ostiole prominent, dark coloured ' and listed the Exsiccata as Scleromyceti Sueciæ no. 31 '. Examination of this collection showed it to be identical with material issued in Fuckel's ' Fungi Rhenani ' as *H. pulvinata*. Petch (1938) listed and described this fungus as *H. pulvinata*.

Hypocrea lactea *Fries.*, *Summa Veg. Scand.*, 383, 1849.

Sphaeria lactea Fr., *Syst. Myc.*, **2,** 337, 1822.

Stroma effuse, smothering substratum, bay-brown or olivaceous, sometimes ochraceous, smooth, punctate with more or less superficial perithecia, byssoid, stroma 0·5–1 mm. thick, pseudoparenchymatous, cells 5–10 μ diameter ; perithecia superficially arranged in a compacted pseudoparenchyma which more or less forms their outer walls. Perithecia oval, 200–250 μ × 250–300 μ, ostiole papillate, 50–75 μ long ; perithecial wall 10–15 μ thick, cells small, 2–5 μ diameter, thin walled, lightly pigmented. Asci cylindrical, 100–120 × 3·5–4 μ, with sixteen part-spores, uniseriately arranged. Spores globose or oval, sometimes pyriform 3–4·5 × 2·5–3·5 μ, echinulate, hyaline.

Collections examined in the Kew herbarium.

' H. lactea ', Upsala, E. P. Fries, 1853 (Fig. 2, 5).

' Sphaeria lactea ', Bethelem, Herb. Schwein.

' H. citrina ', Libert, M.A., Pl. Crypt. Arduennae, fasc. 4, 341, 1837.

Roumeguère C., Fungi Gallici, exs. 2757. (not Roumeguère Fungi Gallici exs. 1467).

Rabenhorst, G. L., Fungi Europaei exs. 629.

Sydow, P., Mycotheca Marchica, 877.
Mycotheca Germanica 2533.

Fuckel, Fungi Rhenani 996.

Rehm, Ascomycetes 677.

ex Herb. A. Ludwig, Flora von Westfalen, 1931.

' H. lactea ' Fuckel's Fungi Rhenani = *H. farinosa* Berk. & Br.

The material labelled ' H. lactea Fr. Upsala, 1855, E. P. Fries ' was taken as authentic. Fries (1822) described *H. lactea* as being ' fleshy, extensively effuse, smooth, creamcoloured, ostiole punctate '. Although Petch (1937) accepted this collection as being typical of Fries' species he held that *H. lactea* was a pallid form of *H. citrina* and his description of *H. citrina* given in British Hypocreales (1938) would apply more correctly to *H. lactea* ; similarly the collections he referred to *H. citrina* are of *H. lactea.*

Hypocrea sulphurea (*Schw.*) *Sacc.*, *Syll. Fung.*, **2,** 535, 1883.

Sphaeria sulphurea Schw., *Trans. Am. Phil. Soc. II*, **4,** 193, 1832.

Hypocrea sub-citrina Kalchbr. & Cke., *Grev.* **9,** 26, 1880.

Stroma effuse, smooth, lemon yellow or ochraceous, punctate with translucent ostioles, margin byssoid, hyaline, 0·3–0·5 mm. thick, prosenchymatous but compacted into pseudoparenchyma in the superficial layer, cells 2–3 μ diameter, hyaline ; perithecia superficial but immersed in compacted pseudoparenchyma. Perithecia globose, 150–200 μ diameter, ostiole 30–50 μ long, not papillate ; perithecial wall 7·5–10 μ

FIGS. 1 & 4. Longitudinal section and spores of *Hypocrea citrina* ex Fries.
FIGS. 2 & 5. Longitudinal section and spores of *Hypocrea lactea* ex E. P. Fries.
FIGS. 3 & 6. Longitudinal section and spores of *Hypocrea sulphurea* ex Schweinitz.

thick, cells small, 2–3 μ diameter, thin walled, hyaline. Asci cylindrical, 80–100 μ, thin walled, sixteen part-spores uniseriately arranged. Part-spores 3–4·5 × 3–6 μ, echinulate and lightly pigmented, oval or pyriform.

Collections examined in the Kew herbarium.

' H. sulphurea ', Salem, Bethlehem, ex Schweinitz (Figs. 3, 6).

' H. citrina ', Ravenel, Fungi Caroliniani Exs. no. 3.
Aitken, S. Carolina, 2779.
Reliquiae Farlowianæ, 32.
Montagne, Cuba.
Colenso, New Zealand, 898.
J. D. Hooker, New Zealand.
W. Archer, Tasmania.
Martin, Victoria, Australia, 1038.
Maitland, Uganda, no. 143.
C. Torrend, Belgium Congo, no. 48.

' H. sub-citrina ' Kalchbrenner, Natal, no. 184.

Material of *H. sulphurea* from Bermuda ex Seaver and Waterston appears to be of an undescribed species.

Australian and New Zealand collections filed under *H. citrina* are referable to *H. sulphurea* ; as in *H. sub-citrina* Kalchbr. spores are slightly larger but this feature is not sufficiently significant to maintain a different species. Seaver (1910) noted that many North American records of *H. citrina* were based on collections of *H. sulphurea.*

Literature Cited

Fries, E. 1822 : *Systema Mycologicum*, **2,** 620 pp.
Petch, T. 1937 : *J. of Bot.*, **75,** 218–231.
—— 1938 : *Trans. Brit. Myc. Soc.*, **21,** 143–305.
Seaver, F. J. 1910 : *Mycologia*, **2,** 48–98.

NOTES ON AFRICAN ASCLEPIADACEAE.* V.

A. A. Bullock

This contribution includes miscellaneous notes, records and new synonymy. The tropical African species of *Tylophora* have been examined in some detail and in particular the distribution of *T. sylvatica* Decne. (p. 582) has been worked out at the request of Dr. J. Léonard of Brussels. It is hoped that collectors will look out for this species in suitable habitats in Tanganyika, Nyasaland, Moçambique and the Rhodesias in order to fill in the very large gaps in its known distribution. One botanically well-known area where it might be expected to occur is the mist forest of the Victoria Falls. An identification of Baillon's genus *Nanostelma* with a well known species of *Tylophora* (p. 585) has arisen out of this work.

There are relatively few elements of the Mediterranean flora in tropical Africa and the new records of the well-known *Periploca laevigata* Decne. (p. 586) are worthy of special notice.

The available material of the genus *Ceropegia* is still inadequate for full scale revisional work ; collectors are asked to pay special attention to this genus and wherever possible to preserve flowers in spirit. The rootstock is also of importance and is in very many species unknown. Field observations leading to an understanding of the pollination mechanism are required. It is probable that the insects concerned are small *Diptera*, but their degree of specificity and their relationship to the trap and release mechanisms of the flowers themselves, are completely unknown. The function of the so-called vibratile hairs borne by some species is also unknown, but may be connected with the pollination mechanism. The new synonymy (for which I alone am responsible) is based on a re-examination of the material in the Kew herbarium in consultation with Mr. C. D. Adams of Achimota College, Gold Coast, and Dr. R. A. Dyer, Chief of the Division of Botany, Pretoria, both of whom have supplied extremely helpful notes and new material.

Tylophora *R. Br.*

Tylophora is a genus of numerous species, widely distributed in the tropical and subtropical regions of the Old World. It was established by R. Brown (Mem. Wern. Soc. **1,** 28 : 1809†) but he did not mention any species by name. The only indication of a type is in the words " Nova Hollandia, praesertim intra tropicum, sed usque ad grad. 33. lat. aust. India Orientalis, et Africa aequinoctialis. Octo species nobis cognitae, quarum nullae adhucdum editae sunt." In his *Prodromus Florae Novae Hollandiae* (1810), Brown repeated his description of the genus and gave brief descriptions (p. 460) of *T. grandiflora*, *T. barbata*, *T. flexuosa* and *T. paniculata* ; it is clear that the type must be chosen from these four. *T. grandiflora* differs considerably in inflorescence and corolla form from the other three and would not be a suitable choice and of the remainder *T. flexuosa* and *T. paniculata* are more closely in agree-

*Continued from Kew Bull. **1954,** 373.

† The adoption of the date 1809 for this publication is explained by Bullock in Kew Bull. **1953,** 64–65 (1953), and in Taxon, **3,** 144 (1954) ; see also Rogers in Taxon, **2,** 181 (1953).—A.A.B.

ment with Brown's description than is *T. barbata*. Brown described *T. flexuosa* from living material and I therefore propose that species as lectotype of the generic name.

Tylophora gilletii *De Wild.* in Ann. Mus. Congo, Sér. 5, **1,** 193 (1904); Dur. Syll. Fl. Congol. 365 (1909).

T. smilacina S. Moore in Journ. Bot. **52,** 29 (1914) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

The type of *T. gilletii* was collected by *J. Gillet* (no. 1656) in the Belgian Congo at Kimuenza, and is deposited in the Brussels herbarium ; that of *T. smilacina* is at the British Museum (duplicate at Kew) and was collected by *Mr. and Mrs. P. A. Talbot* (no. 3252) in the Eket district of Southern Nigeria near the Sacred Lake at Ikotobo. The following additional specimens are at Kew :—

Belgian Congo. Yangambi ; May 1936 (fl.), *Louis* 1863, 2824. Between Bojela and Lolifa ; May 1936 (fl.), *Louis* 1979. Eala, on the right bank of the Ruki river ; May 1936 (fl.), *Louis* 2059.

Tylophora apiculata *K. Schum.* in Engl. Pflanzenw. Ost Afr. **C,** 325 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 407 (1903) ; Brenan, Trees Shrubs Tanganyika Terr. (2), 69 (1949).

Brown remarked that he had seen only a single leaf and a few (very young) flowers of this plant ; these are preserved in capsules at Kew and must be all that is left of the holotype, which was collected by *Stuhlmann* at Pangani. It has now been found again :—

Tanganyika Territory. Lusunguru forest reserve, near Mtibwa sawmill 4 miles north of Turiani, Morogoro District, 500 m. ; " height 4 m., calyx green, corolla green outside, purple inside towards the base, coronal lobes dark purple, staminal column green " ; March 1953 (fl.), *Drummond and Hemsley* 1943 (with spirit material).

Tylophora tenuipedunculata *K. Schum.* in Engl. Bot. Jahrb. **17,** 144 (1893) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 409 (1903).

The holotype of this species was destroyed at Berlin, but there is a duplicate at Kew. The remarkable extension of the range of the species into Uganda indicates that it should be found in the Belgian Congo forests.

Uganda. Kyewaga forest, Entebbe, 3850 ft. ; Nov. 1922 (fl.), *Maitland* 542. Kawarda hill, Kampala, 3850 ft., in forest patch on hillside ; " climbing over neighbouring vegetation to 15–20 ft., flowers maroon ; Nov. 1937 (fl.), *Chandler* 1998.

French Congo. Edge of mountain forest near Povo Zala, Chinchocho district, Loango ; Nov. 1874 (fl.), *Soyaux* 163 (*isotypus specei, in herb. Kew.*).

Tylophora oculata *N. E. Br.* in Kew Bull. **1895,** 112 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 406 (1903) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

T. deightonii Hutch. et J. M. Dalz. *l.c.*, in clavi, et in Kew Bull. **1937,** 340 (1937), descr. lat.

As is shown below, the division of this genus by the character " leaves cordate at the base " *versus* " leaves rounded or cuneate at the base ", is not reliable and although the material of *T. deightonii* is very poor, I have no hesitation in referring it to *T. oculata*.

The species was described from a living plant raised at Kew from seed brought from Sierra Leone by *Scott Elliot* in 1892. It was not collected again until 1914–15, when *N. W. Thomas* made three gatherings of flowering and fruiting material. *Deighton* collected his specimen in 1927 and there is one later collection (*Glanville* 363) from Sierra Leone. The following additional material is at Kew :—

French Guinea. Between Nzerekore and Macenta ; Oct. 1947 (fl.), *Baldwin* 9744.

Liberia. Peáhtah, in virgin forest ; " slender climbing vine " ; Oct. 1926 (fl.), *Linder* 1070.

Gold Coast. Jimira forest reserve, Ashanti, 800 ft. ; " herbaceous climber with small red flowers " ; Oct. 1933 (fl.), *Vigne* 3112 (ex herb. Forestry Institute, Oxford).

Tylophora stenoloba (K. Schum.) N. E. Br. in Kew Bull. **1895,** 257 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 409 (1903) ; Brenan, Trees Shrubs Tanganyika Terr. (2), 69 (1949).

Astephanus stenolobus K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 321 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 223, 224, ff. 65 C–D (1895).

The *locus classicus* of this species is Doda, in the Usambara mountains of Tanganyika, where it was collected by *Holst* (no. 2977a) in June 1893. The holotype was lost at Berlin, but there is an isotype at Kew, in addition to the following :—

Kenya Colony. Duruma R. ; March 1902 (fl.), *Kässner* 395.

Zanzibar. *Vaughan* 1275.

Pemba. *Vaughan* 965.

Moçambique. Msalu River mouth, Nyassa ; Feb. 1912 (fl.), *Allen* 130.

Tylophora oblonga *N. E. Br.* in Kew Bull. **1895,** 257 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 408 (1903) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

T. anfracta N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 408 (1903).

T. liberica N. E. Br. in Journ. Linn. Soc. Bot. **37,** 109 (1905) ; S. Moore in Cat. Talb. Nig. Pl. 136 (1913) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

Each of the species included here was described from single and somewhat poor specimens. The flower-size difference given by Brown (1903) in his key to separate *T. oblonga* and *T. anfracta* indicates only that a younger flower was examined and measured in one case. The bigger dimensions given in his original description were not due to an error, as he stated in 1903, but to the measurement of an older though still immature flower. A primary key division, used by both Brown and Hutchinson and Dalziel, referred to the leaf-base, which may be cordate, rounded or cuneate. The material now available shows that this character is not reliable ; more vigorous shoots tend to produce cordate leaves, but the character becomes progressively less pronounced towards the stem apices. There is a wide variation in leaf size. *T. oblonga* and *T. anfracta* were described from specimens showing only rounded or cuneate based leaves, whilst *T. liberica* was described from a specimen showing leaves with cordate bases. Brown distinguished *T. liberica* from *T. conspicua* N. E. Br., a species with much larger flowers.

T. oblonga was described from Fernando Po (*Mann* 277) and no other material from the island is known. It occurs also in Southern and Northern Nigeria (*Talbot* 3360, 1013, *Newberry* 70, *Keay* 28064) and in the adjoining French Cameroons (*Zenker* 1823). It is not known between this area and Liberia, where it was collected by *Whyte* in the Sinoe Basin. The *Zenker* specimen at Kew is the holotype of *T. anfracta* N. E. Br., but was distributed from Berlin as *T. plagiopetala* K. Schum., the type of which was *Zenker* 1820 from the same locality (Bipinde). It is possible that this name should be added to the new synonymy given above, but the type material was at Berlin and is not now available. In addition to the type specimens mentioned already, the following are at Kew :—

Nigeria. Ibadan, in semi-forest ; " climber, yellowish-green flowers " ; Sept. 1935 (fl.), *Newberry* 70. Sapoba, in the margin of swamp forest on (east) bank of River Jamieson, Benin District ; " slender liane to 4 m. high, leaves pale green below ; corolla yellow-green, anthers deep purple, young fruits green ; white latex " ; Nov. 1950 (fl., fr.), *Keay* 28064 (with fl. and fr. in spirit). Benue River ; *Talbot* 1013. Without locality, *Talbot* 3360.

Tylophora sylvatica *Decne.* in Ann. Sc. Nat. Sér. 2, **9,** 273 (1838) et in DC. Prodr. **8,** 610 (1844) ; Benth. in Hook. Niger Fl. 455 (1849) ; K. Schum. in Engl. Pflanzenw. Ost Afr. **C,** 325 (1895), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 286, ff. 85, O–P (1895), et in Bull. Soc. Bot. Belg. **37,** 123 (1898) ; Hiern in Cat. Afr. Pl. Welw. **1,** 691 (1898) ; Schltr. Westafr. Kautschuk-Exped. 309 (1900) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 408 (1903) ; Palacký, Cat. Pl. Madag. fasc. 3, 35 (1907) ; Dur. Syll. Fl. Congol. 365 (1909) ; Mildbr. Wiss. Ergebn. Deutsch. Zentral-Afr.-Exped. 1907–8, **2,** 545 (1913) ; Lane-Poole, Trees, Shrubs, Herbs and Climbers of Sierra Leone, 95 (1916) ; Norman in Journ. Bot. **67,** Suppl. 2, 97 (1929) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931) ; Choux, Asclepiad. in Cat. Pl. Madag. Publ. Acad. Malgache, 24 (1931) ; Robyns, Fl. Sperm. Parc Nat. Albert, **2,** 106 (1947) ; Brenan, Trees Shrubs Tanganyika Terr. (2), 69 (1949).

This very widely distributed species is particularly abundant in secondary growth of humid forest areas. It shows remarkably little morphological variation and is one of the few widely distributed Afro-Mascarene species which has never excited taxonomic controversy. The *locus classicus* is given by Decaisne as " in sylvis Gambiae haud procul Cicae. Jun. vix flor. legit Leprieur ", but I have seen no material from the Gambia, nor from Senegal, from which area it is recorded by Hutchinson and Dalziel (1931). The material at Kew gives the following distribution :—

French Guinea. *Heudelot* 816. Nzerekore ; Oct. 1947 (fr.), *Baldwin* 9731.

Sierra Leone. Mando ; April 1949 (fl.), *Jordan* 215. Rokupr ; April 1949 (fl.), *Jordan* 229 ; May 1949 (fr.), *Jordan* 256. Njala ; July 1927 (fl.), *Deighton* 738 ; May 1938 (fl., fr.), *Deighton* 3528. Falaba ; March 1892 (fl.), *Scott-Elliot* 5455 (distributed as 4455). Leicester ; June 1914 (fl.), *Lane-Poole* 288. Kuntaia ; June 1914 (fl., young fr.), *Thomas* 418.

Liberia. Gbanga ; Sept. 1926 (fl., fr.), *Linder* 704. Tchien district ; (fr.), *Baldwin* 9010. Cape Palmas ; (fl.), *Vogel* 3.

Gold Coast. Aburi ; Aug. 1900 (fl.), *Johnson* 770 ; Oct. 1900 (fl.), *Johnson* 946. Nsawam ; May 1937 (fl., young fr.), *Irvine* 2837.

Togoland. *Baumann* 511.

Nigeria. " Western Lagos " ; *Rowland* s.n. Odo-Onon, Lagos ; *Dawodu* 173. Oban ; *Talbot* 374, 375, s.n. Without locality ; *Thomas* 1670, 1729, 1823. Ibadan ;

Jan. 1950 (fl.), *Meikle* 1112. Ijebu ; April 1953 (fl.), *Onochie* 15528 ; April 1946 (fl., young fr.), *Tanajing* 16844. Oyo, Ibadan ; June 1947 (fr.), *Latilo* 21011. Ado, Obu ; *Thomas* 44. Akassa ; *Dutton* 29. River Nun ; Sept. 1860 (fl.), *Mann* 479. Ikoyi Plains, Lagos ; August 1919 (fr.), *Dalziel* 1411. Epe ; Feb. 1893 (fr.), *Millen* 166.

British Cameroons. Victoria ; Feb. 1929 (fl.), *Maitland* 432 ; June 1937 (fl.), *Rosevear* 45/37.

Fernando Po. Nov. 1841 (fl.), *Vogel* 237.

French Cameroons. Gatanga ; April 1895 (fl.), *Bates* 197. Bipinde ; *Zenker* 2581, 2704, 2956, 3144. Bosum ; June 1914 (fl., young fr.), *Mildbraed* 9723.

Oubangi-Chari. Ndelle ; April 1903 (fl.), *Chevalier* 8041, 8093.

Belgian Congo. Kisantu ; August 1935 (fl.), *Louis* 44. Yangambi ; Sept. 1937 (fr.), *Louis* 6070 ; Dec. 1937 (fr.), *Louis* 7234 ; May 1938 (fl.), *Louis* 9542 ; Dec. 1938 (fr.), *Louis* 13079 ; Feb. 1939 (fr.), *Louis* 13536 ; June 1939 (fl.), *Louis* 15175. Rutshuru; *Ghesquière* 3847. Coquilhatville ; July 1899 (fl.), *Schlechter* 12610.

Uganda. Lake Mutanda, Kigezi ; Oct. 1947 (fl., young fr.), *Purseglove* 2489. Maracha, West Nile ; April 1940 (fl., young fr.), *Eggeling* 3873. Nkoko ; Dec. 1915 (fl.), *Dümmer* 2702. Bugala, Sese ; Feb. 1933 (fl.), *Thomas* 828. Mushogiri, Kigezi ; Jan. 1933 (fl.), *Rogers and Gardner* 308. Kinala ; April 1916 (fr.), *Dümmer* 2801. Kampala ; April 1932 (fl.), *Hargreaves* 1149. Katera ; Oct. 1953 (fl.), *Drummond and Hemsley* 4534 (with spirit material).

Tanganyika Territory. Maboko Is., Lake Victoria ; Dec. 1939 (fl.), *Hornby* 1085. Mirisoko, Kyimbila district ; Nov. 1910 (fl.), *Stolz* 445.

Northern Rhodesia. Mwinilunga ; Dec. 1938 (fl., young fr.), *Milne-Redhead* 3496 (with spirit material).

Angola. Galungo Alto ; Feb. 1855 (fl.), *Welwitsch* 4230, 4231. N'Dallatando, Cazengo ; Jan. (fl., fr.), *Gossweiler* 4870.

Madagascar. *Baron* 146, 1965, 3734, 4834, 4864, 5775. *Scott-Elliot* 2579, 2667. *Lyall* 24. *Grevé* s.n.

It will be seen that the distribution from French Guinea to Uganda is continuous ; further south it becomes disrupted. The plant probably occurs frequently in damper fringing forests throughout the disrupted area and it is remarkable that there is no specimen at Kew from Nyasaland, Moçambique, or the rain and mist forests of eastern Tanganyika and the Rhodesias.

Tylophora conspicua *N. E. Br.* in Kew Bull. **1895,** 258 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 405 (1903) ; Hiern in Cat. Afr. Pl. Welw. **1,** 691 (1898) ; Norman in Journ. Bot. **67,** Suppl. 2, 96 (1929) Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

T. migoje Schltr., nomen in herb. Kew.

Brown recorded this species from Angola* and from the Gold Coast ; Hutchinson and Dalziel saw material also from the Ivory Coast. The following additional records extend the known range of the species to East Africa :—

Uganda. Forest in Entebbe Botanic Garden, 3900 ft. ; " climber 10–15 ft., flowers dull reddish purple " ; Oct. 1935 (fl.), *Chandler* 1434.

Tanganyika Territory. Amani ; Nov. 1922 (fl.), *Soleman* 6221. Near Kimboza on Mikese–Kisaki road, Morogoro district, 1300 ft., in rain-swamp forest in black soil on a limestone formation ; " climbing perennial growing over bushes and small trees, with purple flowers ; not common " ; Sept. 1930 (fl.), *Greenway* 2521. Rungwe, Kyimbila district, 1800 m. ; "climbing plant with purple flowers and unpleasant odour"; March 1912 (fl.), *Stolz* 1165.

In addition to the above, two sterile specimens may be referable to this species :—

French Cameroons. Bipinde ; *Zenker* 3780.

Belgian Congo. Yangambi ; Aug. 1939, *Louis* 15811.

* Brown cited two gatherings under his original description and I have chosen the Kew specimen of *Welwitsch* 4214 as the lectotype—A.A.B.

Tylophora anomala *N. E. Br.* in Thiselton-Dyer, Fl. Cap. **4** (1), 766 (1908).

The two specimens from Natal cited by Brown are parts of the same gathering, but are mounted on two sheets in the Kew herbarium. Brown also saw a specimen of the same gathering in the Dublin herbarium, but there is no doubt that the Kew material must be regarded as the type of the specific name.

There has, apparently, been no further collection of this species in Natal ; in a letter to Brown dated September 1914, J. Medley Wood reported that the original locality was being cleared for building purposes, and the plant was in danger of extermination. In 1948, however, *Mrs. H. Faulkner* collected a plant in the Mocuba district of Moçambique which I believe is conspecific, and with which I have identified certain collections by *Stolz* in southern Tanganyika. Some of these were distributed from Berlin bearing Schlechter's manuscript name *Tylophora stolzii*.

The tropical material is much more floriferous than the rather poor specimens from Natal and bears leaves of more coriaceous texture up to 12·5 cm. long and 8·5 cm. wide. I am unable, however, to find any characters by which it can be separated specifically.

Moçambique. Namagoa, Mocuba district, 200 km. inland from Quelimane, 60–120 m., in rain forest ; " climbing and twining over bushes and to the summits of large forest trees ; latex in stems ; leaves very bright yellowish green or green " ; Aug. 1943 (fl.), Oct. (fr.), *Faulkner* 140 (*ex herb. Pretor.*). *Ibid.* Nov. 1948, Aug. 1949, Sept. 1949 (fl., fr.), *Faulkner* 466.

Tanganyika Territory. Kyimbila District. Mbaka, 1600 m. ; March 1912 (fl.), *Stolz* 1158. Without exact locality ; *Stolz* 1165. Kyimbila, 1350 m., May 1912 (fl.), *Stolz* 1251 ; March 1913 (fl.), *Stolz* 1963 ; Dec. 1912 (fr.), *Stolz* 1759.

Tylophora gracillima *Markgraf* in Notizbl. Bot. Gart. Berlin, **13,** 284 (1936) ; Brenan, Trees Shrubs Tanganyika Terr. (2), 69 (1949).

Specimens now available at Kew show a great variation in leaf-shape which may be correlated with rainfall. At Tegetero, in the Uluguru mountains, the leaves are ovate, rounded at the base and the acute apex is drawn out into a short hair-like apiculus ; they are about 1 cm. long and 5–6 (–7) mm. wide. In the Mkuzi valley of the West Usambara mountains they are very narrowly lanceolate and tend to be triangular-cuneate at the base, whilst the apex retains the hair-like apiculus ; they are 2 cm. or more long and only 2–2·5 mm. wide near the triangular base. The leaves of *E. M. Bruce* 945 are intermediate in shape and her specimen was collected at a somewhat higher altitude in the Uluguru mountains. The first locality has a rainfall of 80–90 inches, the second scarcely half of this, and the third is intermediate.

The holotype (*Schlieben* 3067) was collected at 1,400 m. in the north-western Uluguru mountains, and Markgraf also cited *E. M. Bruce* 342.

Tanganyika Territory. Morogoro District : Tegetero, Uluguru Mts., 1100 m., in lowland rain forest ; " twining to 3 m., calyx green, corolla liver purple, central column green, fruits green " ; March 1953 (fl., young fr.), *Drummond and Hemsley* 1698 (with spirit material) : Kisaki road, 4500 ft., in forest overhanging river ; Dec. (fl.), *E. M. Bruce* 342 : Kitandu, 5000 ft., in forest ; " an abundant 6 ft. liane " ; March (fl., young fr.), *E. M. Bruce* 945. Lushoto District : Mkusu valley, between Mkuzi and Kifungilo, West Usamba Mts., 1600 m., on tree stump in forest by river ; " twining, calyx green, corolla very dull reddish-purple " ; April 1953 (fl.), *Drummond and Hemsley* 2224 (with spirit material).

Tylophora cameroonica *N.E.Br.* in Kew Bull. **1895,** 258 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4,** (1), 407 (1903); Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

This species has been recorded hitherto only from the Cameroons Mountain (Buca, *Dalziel* 8236) and Rio del Rey (*Johnston* s.n., the holotype), though the following specimens have been at Kew for many years :—

Uganda. Makere, Kampala, 3800 ft.; "a vigorous climber with thick fleshy dark green leaves and clear slightly viscid juice; "May 1926 (fr.), *Maitland* 1073. Road below Budo, off the Masaka road, near Kampala, at the edge of a moist forest patch, 3900 ft.; "climbing or trailing, 6–8 ft. or more, leaves light green, buds and flowers wine-colour to light reddish-purple"; April 1939 (fl.), *Chandler* 2789.

Tylophora glauca *Bullock*, sp. nov., a *T. cameroonica* N. E. Br. caulibus petiolis et inflorescentiis dense tomentosis facile distinguitur.

Frutex scandens, caulibus glaucis circiter 5 mm. diametro dense hirsuto-tomentosis, internodiis 15 cm. vel ultra longis. *Folia* glauca, integra, petiolata, petiolis dense hirsuto-tomentosis supra canaliculatis apice glandulis papillosis 3–4 obtectis, rotundata, circiter 8–14 cm. diametro, apice acute apiculata, basi satis profunde cordata, nervis lateralibus utrinque 4–5 arcuatis, superne pilis brevibus paucis induta, subtus glauca et venis primariis tantum leviter pilosa, ut videtur satis succulenta. *Cymae* tomentosae, ex axillis foliorum 2–3 ortae, pedunculis 2–5 cm. longis, ramis primariis usque 2 cm. longis sed interdum obsoletis, floribus apicibus ramulorum ultimorum congestis, pedicellis circiter 2 mm. longis. *Calyx* dense tomentosus, fere ad basin 5-partitus, lobis triangularibus acutis circiter 1·5 mm. longis. *Corolla* saturate purpurea, rotata, 6·5 mm. diametro, lobis ovatis subacutis 2·5 mm. longis et 2 mm. latis, extra intusque leviter pilosa. *Coronae tuberculi* 5, patentes, carnosi, vix 0·5 mm. longi latique. *Folliculi* (haud maturi) fusiformes, secus suturam recti, dorsaliter arcuati, 7 cm. longi, 1·5 cm. vel ultra diametro, apice subacuti.

Nigeria. Obomkpa village, Asaba district, Benin; " climbing shrub, climbing over *Euphorbia* hedge; undersurface of leaves, and stems, glaucous; broken stems exuding clear fluid; flowers dark purple"; August 1953 (fl., young fr.), *Onochie* 33430 (with flowers and fruit in spirit) (*holotypus in herb. Kew.*).

Tylophora congolana (*Baill.*) *Bullock*, comb. nov.

Nanostelma congolanum Baill. Hist. Pl. **10,** 248 (1890), in adnot.; K. Schum. in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 248 (1895); N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 411 (1903).

Tylophora orthocaulis K. Schum. in Engl. Bot. Jahrb. **23,** 235 (1896); N. E. Br. *l.c.* 410; A. Chev. Expl. Bot. Afr. Occ. Franç. 436 (1920); Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 59 (1931).

Schizoglossum glanvillei Hutch. et J. M. Dalz. *l.c.* 58, in clavi et enum. et in Kew Bull. **1937,** 340 (1937), descr. lat. ampl.

It was suggested by Schumann (1896) that *Nanostelma congolanum* might be the same as his *Tylophora orthocaulis*, and in view of the very distinct habit of the plant I have no doubt that this is so. Baillon described his monotypic genus *Nanostelma* as a Congo plant; Schumann's *Tylophora orthocaulis* was based upon an unlocalized specimen collected by Afzelius,

presumably in Sierra Leone, and *Schizoglossum glanvillei* was also based upon plants collected in Sierra Leone. There is an unlocalized specimen at Kew collected by *Mildbraed* (no. 9562) in the French Cameroons, and Chevalier's (1920) records are from French Guinea.

Secamone *R. Br.*

Secamone afzelii (*Schultes*) *K. Schum.* in Engl. Bot. Jahrb. **23,** 234 (1896).

Apocynum frutescens Bånge ex Afzel. Remed. Guin. 28 (1815), non Linn. (1753), nec *Secamone frutescens* Decne. (1844).

Ichnocarpus afzelii Schultes in Roemer et Schultes, Syst. Veg. **4,** 399 (1819).

Secamone myrtifolia Benth. in Hook. Niger. Fl. 453 (1849) ; K. Schum. in Engl. Bot. Jahrb. **23,** 234 (1896), et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 262 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 280 (1902) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 54 (1931).

This species, the most widely distributed of the genus in western Africa, occurs in the humid forest from Sierra Leone to the Cameroons and Gabon. It has been masquerading under the wrong name for over a half a century owing to the operation of the old " Kew " rule. K. Schuman (1896) apparently accepted two distinct species, Brown (1902) being the first to recognize the synonymy.

Periploca *Linn.*

Periploca laevigata *Ait.* Hort. Kew. **1,** 301 (1789) ; A. Chev. in Rev. Bot. Appl. **15,** 923 (1935).*

British Somaliland. Dabalaidshe Mt., Libah Heleh range, 10° 20′ N., 43° E., 5800 ft., at the mountain top (limestone), with scattered *Juniperus procera* ; " climbing, flowers yellow ; " Dec. 1932 (fl., fr.), *Gillett* 4712. Las Anod ; Feb. 1942 (sterile), *Peck* 122. Las Anod hills, in a drainage channel ; " erect shrub, 4 ft., with milky juice and greenish-yellow flowers ; " May 1945 (fl.), *Glover and Gilliland* 109.

This species was sent to Kew by Masson in 1779 from the Canary Islands ; it is now known to be generally distributed in the Mediterranean region and the Cape Verde Islands (S. Antao, Fogo and S. Thiago; of the specimens cited by Chevalier, his own number 44879, from Fogo, is represented at Kew), but this is the first record of the species from Tropical Africa. Mr. Gillett's specimen includes old follicles (without seeds), a very young pair of follicles and a few very immature buds. The flowers, which he described as yellow, have evidently fallen off and have not been preserved. The specimen has lain for twenty years in the *incertae sedis* and was not included in the list of Mr. Gillett's Somaliland plants published by Dr. Hutchinson and Miss Bruce in the Kew Bulletin in 1941.

The following references give a more detailed distribution for the species :—

Willk. in Willk. et Lange, Prodr. Fl. Hispan. **2,** 667 (1870) ; Boiss. Fl. Orient. **4,** 50 (1879) ; Parlatore, Fl. Ital. **6,** 716 (1886) ; Batt. et Trabut, Fl. Algérie, 584 (1890) ; Muschler, Man. Fl. Egypt, **2,** 743 (1912) ; Pampanini, Pl. Tripolit. 190 (1914) ; Borg, Descr. Fl. Maltese Is. 447 (1927) ; Post, Fl. Syria, Palest. Sinai, ed. 2 (Dinsmore), **2,** 190 (1933) ; Jahandiez et Maire, Cat. Pl. Maroc, **3,** 580 (1934).

* A. Chevalier, " Les Iles du Cap Vert. Flore de l'Archipel ", a reprint from Rev. Bot. Appl. 15, pp. 733–1090, tt. 16 (1935).

Mangenotia *Pichon*

This genus was described by M. Pichon shortly before his tragic death in 1954 and was based upon a plant collected by Prof. Mangenot in the Ivory Coast in June 1951. In his discussion of the genus Pichon indicated that it is nearest to "*Calotropis*", but this is an obvious *lapsus calami* for *Cryptolepis*, to which the genus is closely allied. It may be distinguished by the very hairy sessile anthers and the constriction in the tube of the corolla and by the very slender pollen carriers. The specimens enumerated below are in the Kew herbarium and have been identified *ex descriptione*.

Mangenotia eburnea *Pichon* in Bull. Soc. Bot. France, **101,** 246 (1954), cum ic. diagn.

Sierra Leone. Matotoka, 400 ft. ; July 1914 (fl.), *Thomas* 1238. Mayoso, 350 ft. ; Aug. 1914 (fl.), *Thomas* 1373. Yonibana ; Oct. 1914 (sterile), *Thomas* 4077 ; Oct. 1914 (fl.), *Thomas* 4119, 4202. Mamaha ; Nov. 1914 (fl.), *Thomas* 4377, 4427, 4546, 4628 ; Nov. 1914 (fr.), *Thomas* 4544. Port Lokoh ; Dec. 1914 (fl., fr.), *Thomas* 6585, 6602. Sukudu, Konno ; July–Aug. 1923 (fl.), *Dawe* 543. Without locality or data (fl.), *Thomas* 3573.

Gold Coast. Mampang Scarp, 1400 ft., in forest ; "climber with white flowers" ; May 1929 (fl.), *Vigne* 1739.

Nigeria. Ikoyi Plains, Lagos ; "shrub, erect at first, later climbing and twining, juice milky, flowers creamy white" ; Aug. 1919 (fl.), *Dalziel* 1405.

Echidnopsis Hook. f.

Echidnopsis dammanniana *Sprenger* in Cat. Dammann, 4, f. 5 (1892); K. Schum. in Monatsschr. Kakteenk. **3,** 101 (1893), in obs., et in Engl. et Prantl, Naturl. Pflanzenfam. **4** (2), 274 (1895) ; N. E. Br. in Gard. Chron. Ser. 3, **16,** 53 (1894), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 475 (1903) ; Penzig in Atti Congr. Bot. Internaz. **1892,** 349 (1893) ; Berger in Malpighia, **16,** 161, t. 3, ff. 13–14 (1902), White et Sloane, Stapelieae, ed. 2, **3,** 981 (1937).

Boucerosia cylindrica Brongn. in Bull. Soc. Bot. France, **7,** 900 (1860), non *Apteranthes cylindrica* Decne. (1871), nec *Echidnopsis cylindrica* (Decne.) K. Schum. (1895).

Echidnopsis somalensis N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 477 (1903) ; White et Sloane, Stapelieae, ed, 2, **3,** 980 (1937).

? *E. cereiformis* Hook. f. var. *obscura* Berger in Malpighia, **16,** 160 (1902).

This species was originally discovered by Dr. A. Courbon, who found it near Halay in Eritrea during an expedition to the Red Sea area in 1859–60. The epithet applied to it by Brongniart cannot be used under *Echidnopsis* on account of *E. cylindrica* (Decne.) K. Schum. (which appears to be no more than a form of the very well known *E. cereiformis* Hook. f.).

Penzig (1893), who attributed the epithet *dammanniana* to Schweinfurth in his *Piante raccolte in un viaggio botanico fra i Bogos ed i Mensa, nell' Abissinia settentrionale*, sent living specimens from Geleb, Eritrea, to Messrs. Dammann and Co. of Florence and it was described and figured in their catalogue by Sprenger. *E. somalensis* N. E. Br. was also described from cultivated plants, sent to Kew by Mrs. Lort Phillips from British Somaliland. The species is evidently widely distributed in the north-eastern

corner of Africa, but is probably a rare plant throughout its range. It has recently (1952) been collected by Dr. A. E. Schelpe in *Acacia* savannah at about 5,000 ft. on the north-east shore of Lake Shale about fifty miles north of Addis Ababa (7°N., 38°E.). Living plants were sent to the University Botanic Garden, Oxford and the Curator, Mr. G. Robinson, A.L.S., sent one to Kew where it flowered abundantly in May–June 1954. A specimen has been preserved in spirit.

Echidnopsis serpentina (*Nel*) *White et Sloane*, Stapelieae, ed. 2, **3,** 987 (1937).

Caralluma tessellata Pillans in Kew Bull. **1933,** 187 (1933), non *Echidnopsis tessellata* (Decne.) K. Schum. (1895).

Caralluma serpentina Nel in Jahrb. Kakt. Ges. **1,** 23 (1935).

Echidnopsis framesii White et Sloane, *l.c.* 985.

The types of both *Caralluma tessellata* and *C. serpentina* were collected near Van Rhynsdorp ; the stem of the former is said to be six-angled and of the latter eight-angled, a difference attributable to age and vigour. I have been unable to detect any other difference which might be of specific significance.

Cynanchum *Linn.*

Cynanchum defoliascens *K. Schum.* ; Bullock in Kew Bull. **1954,** 363 (1954).

Whilst my previous note was in the press, Mr. B. Verdcourt of the East African herbarium informed me that he had identified, *ex descriptione*, several specimens which he has now very kindly sent on loan to Kew, with permission to extract duplicates for the Kew herbarium.

All the specimens were collected by Mr. G. Popov, of the Desert Locust control service and are as follows :—

British Somaliland. Hagal, in sandy plain ; " erect herb, about 2 ft., tips of branches twining, no milky juice " ; Dec. 1953 (old fr.), *Popov* 1143a. Near Bulbas, 200 ft., in sandy plain ; " woody bush 12–18 ins., flowers small, yellow " ; Jan. 1954 (fl.), *Popov*. 1235.

French Somaliland. Near Jibuti, 200 ft., in lava field with silted sand ; " herb about 18 ins., flowers small, yellow (grazed) " ; Jan. 1954 (fl.), *Popov* 1247 (DANBILLA : Dankali).

Kenya Colony. Loya, Turkana, 3000 ft., in sandy plain ; " woody herb about 12–18 ins., flowers small, greenish " ; April 1954 (fl.), *Popov* 1494.

Aspidoglossum *E. Mey.*

The following notes are supplementary to my earlier (Kew Bull. **1952,** 417-420 : 1952) discussions of the same species. I have not seen specimens of *Schizoglossum gracile* Weim., *S. rhodesicum* Weim. and *S. lanatum* Weim. (in Botan. Notis. **1935** (22), pp. 384, 390, 392, but they certainly belong to the genus *Aspidoglossum*. A preliminary examination of the genus in South Africa indicates that a large number of the species (referred to *Schizoglossum* in the *Flora Capensis*) should be reduced. This, however, involves the dissection of almost every available specimen and reassessment of intraspecific variability, and it will be a considerable time before this work can be completed.

Aspidoglossum erubescens (*Schltr.*) *Bullock*, comb. nov.

Schizoglossum erubescens Schltr. in Journ. Bot. **33,** 306 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 359 (1902).

S. whytei N. E. Br. *l.c.* 357.

Aspidoglossum whytei (N. E. Br.) Bullock in Kew Bull. **1952,** 418 (1952).

In his key to the species of *Schizoglossum*, Brown (1902) by an oversight placed *S. erubescens* in a group without " long woolly hairs " on the corolla-lobes—possibly because the material available to him showed only buds and very young flowers. There is no doubt, however, that it is conspecific with *S. whytei*, the material of which shows mature flowers. The species is apparently confined to the highlands of Nyasaland, and there are no recent collections of it at either Kew or the British Museum.

Aspidoglossum interruptum (*E. Mey.*) *Bullock* in Kew Bull. **1952,** 419 (1952).

Schizoglossum elliotii Schltr. in Journ. Bot. **33,** 305 (1895) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 359 (1902).

S. debile Schltr. *l.c.*

S. togoense Schltr. in Engl. Bot. Jahrb. **38,** 31, f. 1, L–T (1905).

S. eylesii S. Moore ; Weim. in Botan. Notis. **1935** (22), 388 (1935).

[*S. angustissimum* (non K. Schum.)—A. Chev. Expl. Bot. Afr. Occ. Fr. 433 (1920) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 58 (1931).]

I have not seen *Schizoglossum zernyi* Markgraf [in Notizbl. Bot. Gart. Berlin, **14,** 116 (1938)], from the Matengo highlands of Tanganyika, but it seems probable from the description that it should be placed here. The additional (new) synonymy given above extends the range of this species westwards to the Gold Coast and French Sudan.

Aspidoglossum angustissimum (*K. Schum.*) *Bullock* in Kew Bull. **1952,** 418 (1952).

The distribution given in my 1952 note should be amended to exclude French Sudan, which was included on the authority of Chevalier's (1920) record which I have (*supra*) transferred to *A. interruptum*. I have not seen specimens of *A. angustissimum* from any area west of Bamenda, British Cameroons (*Maitland* 1384, 1453, 1775).

Ceropegia *Linn.*

Revisional work on this genus is greatly handicapped by lack of material. Very many of the species described during the last 60 or 70 years have been based on single gatherings and authors have not given due allowance for possible variation in the field, for differences due entirely to differences in physiological age of the flowers they have dissected, or to artefactal variation due to differences in preparation techniques.

A further source of error has been an almost slavish adherence to the idea of very close endemism, an idea which has never had any factual

support. It is now recognised that it is bad practice to describe new species from tropical Africa without accounting for all the species already known, even from very distant areas.

Ceropegia meyeri-johannis *Engl.* Hochgebirgsfl. Trop. Afr. 343 (1892) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 449 (1903) ; Werderm. in Engl. Bot. Jahrb. **70,** 222, t. 13, f. 44 (1939).

C. calcarata N. E. Br. *l.c.* 453.

C. verdickii De Wild. in Ann. Mus. Congo, Sér. 4, **3,** 109 (1903) ; N. E. Br. *l.c.* 620 (1904) ; Werderm. in Engl. Bot. Jahrb. **70,** 222, t. 13, f. 44 (1939).

C. kaessneri S. Moore in Journ. Bot. **48,** 256 (1910) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 239 (1938), et in Engl. Bot. Jahrb. **70,** 223, t. 13, f. 48 (1939).

C. angiensis De Wild. Pl. Bequaert. **4** (3), 358 (1928) ; Wederm. in Bull. Jard. Bot. Brux. **15,** 240 (1938), et in Engl. Bot. Jahrb. **70,** 221, t. 12, f. 43 (1939).

C. meyeri-johannis Engl. var. *verdickii* (De Wild.) Werderm. in Bull. Jard. Bot. Brux. **15,** 228 (1938).

C. criniticaulis Werderm. in Bull. Jard. Bot. Brux. **15,** 232 (1938).

There is nothing surprising in this somewhat extensive new synonymy ; the names involved are in all cases based on single specimens taken from widely separated localities within a region where the flora is fairly uniform, covering parts of Nyasaland, Northern Rhodesia, Belgian Congo and Tanganyika.

Ceropegia sobolifera *N. E. Br.* in Kew Bull. **1895,** 261 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 444 (1903) ; Werderm. in Engl. Bot. Jahrb. **70,** 207, t. 9, f. 19 (1939).

C. subtruncata N. E. Br. *l.c.* 260, et *l.c.* ; Werderm. *l.c.* 210, t. 9, f. 23.

I have been unable to find any differences of specific value between the two " species " united here ; Brown's (1903) descriptions of the corona indicate differences, but my own dissections agree very well with Werdermann's. The calyx and pedicel in *Schimper* 628, the holotype of *C. subtruncata*, is more definitely hairy than in the type of *C. sobolifera*, and the specimen—a long twining shoot—has larger leaves ; these are, however, variations readily explicable as due to habitat and I see no reason for maintaining two species.

The holotype of this species (*Schimper* 463) is at Kew, but the specimen is without the notes given by Werdermann as follows :—" Akallo-Méda nach Madché-Machiha, auf Felsen, ca. 33 3500 m. ü.M. (bluhend am 18 August 1852)." The Kew specimen of *Schimper* 628 is also without notes, and Werdermann gives " Ohne nähere Angaban, 1853." A hundred years elapsed between Schimper's first collection and the two gatherings recorded below. Mr. Gillett obtained the vernacular names HARAMAT DANAU (Somali), and HANGEIYA (Boran).

Kenya Colony. Moyale, Northern Province : 3700 ft., in granite rocks by a torrent ; " twiner with succulent stem and leaves, juice not milky ; corolla greenish-cream with crimson flecks ; one only seen ; eaten by goats " ; April 1952 (fl., old fr.). *Gillett* 12832

(with spirit material) ; 3800 ft., on ridge in bush ; " twiner ; corolla greenish with crimson markings ; juice yellowish, clear, copious ; stem and leaves sucuulent ; one only ; eaten by people ; probably equal to no. 12832 but more crimson on corolla-tube " ; April 1952 (fl.), *Gillett* 12895 (with spirit material).

Ceropegia racemosa *N. E. Br.* in Kew Bull. **1895,** 262 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 456 (1903) ; Werderm. in Engl. Bot Jahrb. **70,** 207 (1939).

C. angusta N. E. Br. *l.c.* 261, et *l.c.* 458 ; Hiern in Cat. Afr. Pl. Welw. **1,** 695 (1898).

C. kamerunensis Schltr. in Engl. Bot. Jahrb. **51,** 154 (1913) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 234 (1938).

C. atacorensis A. Chev. in Bull. Soc. Bot. France, **61,** Mém. 8, 273 (1917), et Expl. Bot. Afr. Occ. Franç. **1,** 439 (1920).

C. gourmaca A. Chev. *l.c.* 274, et *l.c.*

C. glabripedicellata De Wild. in Rev. Zool. Afr. **8,** Suppl. Bot. 2 (1920).

C. pedunculata Turr. in Kew Bull. **1921,** 389 (1921) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 62 (1931).

C. bajana Schltr., nomen in Herb. Kew.

Werdermann (1938), included *C. glabripedicellata* De Wild. and *C. pedunculata* Turr. in his synonymy of *C. kamerunensis* Schltr. ; in 1939 he suggested that this might be conspecific with *C. racemosa* N. E. Br. In 1931 Hutchinson and Dalziel reduced *C. atacorensis* A. Chev. and *C. gourmaca* A. Chev. to the synonymy of *C. pedunculata* Turr. It will be seen, therefore, that the new synonymy given above merely completes for the whole of Tropical Africa an assessment which has been largely carried out previously on a regional basis. The geographical distribution is from Jurland westwards to the Gold Coast and French Sudan, and southwards to Angola. It seems likely that the species may be found in suitable habitats in eastern Africa. It is a plant of open savannah country, where it occurs in rock crevices often associated with streams and rivers ; it is described as a herbaceous twiner or a trailing herb and the corolla tube and tips of the lobes are red-brown or purple, the main parts of the lobes being yellow or greenish-yellow.

Ceropegia nigra *N. E. Br.* in Kew Bull. **1895,** 261 (1895) ; et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 440 (1903) ; Hutch. et J. M. Dalz. (1930) ; Hutch. et Fl. W. Trop. Afr. **2,** 63 (1931).

C. kroboensis N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 440 (1903); Hutch. et J. M. Dalz. *l.c.*

The holotype of this species was collected " on the Niger " by *Baikie* and was received at Kew in 1865 and there is no other collection at Kew from this area ; there is, however, an unlocalized specimen collected by *Mildbraed* (no. 10091) in the French Cameroons. The holotype of *C. kroboensis* was collected by *Johnson* (no. 790) on the Krobo Plains, Gold Coast, and there is at Kew a further Gold Coast specimen collected by *Vigne* (no. 4047) at Apla. The plant flowers in October. The corolla-lobes are described as either black or metallic blue-green, and the tube is yellow. It is clearly very near to *C. papillata* N. E. Br. a species known

only from Nyasaland and southern Tanganyika, from which it differs in its open corolla-limb without long crisped cilia and its stiffly pubescent corolla-tube.

Ceropegia volubilis *N. E. Br.* in Kew Bull. **1895,** 261 (1895), et in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 446 (1903) ; Hiern in Cat. Afr. Pl. Welw. **1,** 695 (1898).

C. scandens N. E. Br. *l.c.* 262, et *l.c.* 449 ; Hiern, *l.c.* 696.

Only the type material (*Welwitsch* 4272, 4273, from Galungo Alto, Angola) of the two species here united is available for study, but I am unable to find any differences of specific importance between them. The flower size differences given by Brown are merely the differences between young and mature flowers, whilst the larger leaves of *C. scandens* merely indicate that the specimen was taken from a more luxuriant plant. There is nothing in Welwitsch's notes, quoted by Hiern (*l.c.*) to indicate specific differences.

Ceropegia johnsonii *N. E. Br.* in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 451 (1903) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 63 (1931).

C. lujai De Wild. in Bull. Jard. Bot. Brux. **7,** 28 (1920) ; Werderm. in Bull. Jard. Bot. Brux. **15,** 235 (1938).

Werdermann (1938) recorded this species from numerous localities in the Belgian Congo but there is only one Congo specimen at Kew, from Yangambi (*Louis* 12248), which I am unable to separate specifically from *C. johnsonii*, a species described from a Gold Coast specimen collected in the " Aburi Garden " by *Johnson* (no. 768) in July 1900. The same collector obtained further material from the same place in November, 1902 (no. 1055). Whether this means that the plant is an introduction to the Gold Coast or not remains to be determined.

Ceropegia abinsica *N. E. Br.* in Kew Bull. **1914,** 168 (1914) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 62 (1931).

C. hepburnii Hutch. et J. M. Dalz. *l.c.* 61, in clavi, et 62, enum.

C. tamalensis W. W. Sm. in Notes Roy. Bot. Gard. Edinb. **13,** 308 (1922) ; Hutch. et J. M. Dalz. *l.c.* 63.

All the available material was collected in Northern Nigeria and the Gold Coast ; there seems to be no good reason for dividing it into more than one species.

Ceropegia campanulata *G. Don*, Gen. Syst. **4,** 112 (1837) ; Benth. in Hook. Niger Fl. 457 (1849) ; N. E. Br. in Thiselton-Dyer, Fl. Trop. Afr. **4** (1), 462 (1903) ; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. **2,** 63 (1931).

C. kerstingii K. Schum. in Engl. Bot. Jahrb. **33,** 326 (1903) ; Hutch. et J. M. Dalz. *l.c.* 63.

C. dalzielii N. E. Br. in Kew Bull. **1913,** 302 (1913) ; Hutch. et J. M. Dalz. *l.c.* 62.

C. porphyrotricha W. W. Sm. in Notes Roy. Bot. Gard. Edinb. **13,** 307 (1922) ; Hutch. et J. M. Dalz. *l.c.* 63.

The diagnostic features of the " species " here united, as given by their authors, fall within a comparatively narrow range of variation, which I consider to be insufficient for specific differentiation. Examined as units of a single taxon, the available material shows small but permissible intra-specific variation, whilst the geographical distribution—Gold Coast and northern Nigeria,—suggests a wide savannah distribution now recognised as normal.

Mr. C. D. Adams has recently collected the plant on the Accra Plains and has observed it in cultivation. With his permission I append his notes, very slightly edited :—

" *Ceropegia* sp. Coll. *C. D. Adams* 967, Accra plains, near Achimota, Gold Coast, 17/3/51.

The plant was collected for growing, and at the time of collection the flower was fully formed but unopened ; colour pale bright green, tube and lobes glabrous.

Later in the evening the lobes began to separate and the long white hairs on their inner surface were exposed ; shortly after dark (6.45 p.m.) the flower was fully opened. By this time there was some red colour at the base of the tube and along the margins of the lobes. Next morning the lobes which had been fully reflexed along the long axis so that none of the original outer surface was visible, were becoming flaccid and the separated edges were closing together, and by the ensuing evening the lobes had collapsed from the originally erect position and were hanging down. (The rapid senescence of this flower was probably due to the disturbance in transplanting ;—see later notes). The following morning the corolla had dropped from the plant leaving the calyx teeth surrounding a small green ovary.

During the maturation and senescence of the corolla there was a gradual loss of green colour which was replaced by red or purple.

The fallen corolla was deep purple at the widest part of the base and white below that. The upper part of the tube was a pinkish purple and the lobes a deeper purple more or less masked by the white hairs.

28/7/51 (same plant).

The enlarging bud has been apparent for about a week. Position sub-terminal, axillary. Flower open this evening about 5 p.m.

The bud is pale green, gradually becoming lighter in colour. The swollen base eventually becomes white. Just before opening the whole flower is very pale green except for the white tube-base, and a slight purpling at narrowest part of waist and along the appressed margins of the corolla lobes. Entirely glabrous outside.

Dimensions of open flower :—

Total length of corolla	71 mms.
Length of tube	35 mms.
Length of lobes	36 mms.
Width at swollen base	8 mms.
Width at narrowest part of waist ...	3·5 mms.
Width at tube mouth	16 mms.
Widest lateral expansion of lobes ...	12 mms.
Width of single lobe	2 mms.
Length of triangular base of lobe ...	8·5 mms.
Width of triangular base of lobe... ...	10 mms.
Widest aperture between adjacent lobes	5 mms.
Length of pedicel	13 mms.
Diameter of pedicel at top	1·5 mm.
Length of sepal lobe	5 mms.
Length of hairs on inner face of corolla lobes (average)	2·5 mms.

The flower has a scent of " stink beetles ".

By 7 p.m. the corolla lobes were completely folded outwards so that the outer surface was no longer visible. The hairs which are thus exposed are white and are longer on the margin of the lobe than on the inner central portion where they are quite short. The throat is glabrous except on the inwardly projecting lower continuations of the lobes.

The corolla is curved upwards at the narrowest part of the waist, the axis of the corolla lobes and mouth making an angle of about 35° with the axis of the pedicel and swollen base.

The tube and swollen base are conspicuously veined longitudinally.

29/7/51.

The stink beetle scent had disappeared by morning, but the flower was still mainly green.

The plant was leafy at flowering time.

Stem. 15 cms. long, diameter 1·5 mms. base, 1 mm. at top, green, pubescescent, erect.

Leaves. 12 pairs of opposite leaves present at flowering, all curved downwards ; linear-lanceolate, acute, rather abruptly narrowed at the base to a short petiole, 5–8 cms. long, 4–7 mms. broad ; petiole 1–3 mms. ; the leaf is grooved along the midrib above ; midrib rather prominent below ; the leaf is pubescent above and on the midrib only below ; the lamina below is very shiny and greyish.

At the swollen node near the base of the petiole and on each side of it are two small pointed stipule-like bodies.

Tuber. Discoid, 3 cms. in diameter and 2 cms. thick. The juice of the plant is watery.

During the second day of flowering the colours of the various parts of the flower differentiate. The corolla lobes become pale yellow-green as does the upper part of the throat within. The margins of the triangular bases of the lobes remain purple. The tube of the corolla when viewed in direct light is pale grey-green and fairly highly reflective. The waist is more purplish. When viewed by transmitted light the upper half of the tube is nearly the same colour as the lobes. The waist and swollen base are darker and greyish. The extreme base is white.

The calyx-lobes are green where they unite at the base and become lighter upwards. They are purple at the tip.

30/7/51.

The colour of the flower is now paler and more pink. The pinkish-purple colour has spread upwards and downwards from the waist. The characteristic scent did not return after the first evening.

At this time the flower has begun to droop. The turgor which has maintained the position of the corolla lobes is released and the lobes are beginning to uncurl longitudinally."

British Knapweeds.*—The *raison d'être*, and perhaps the best review, of this fascinating book is to be found in the first two paragraphs of Sir Edward Salisbury's foreword to it :—

" To-day the need is for detailed acquaintance with the living plants, their breeding behaviour, and their reaction to environmental conditions at all stages of development.

" This monographic study has a far wider interest than that of the particular group of plants with which it is concerned, for such intensive investigations as the authors have undertaken into the nature of these wild populations of closely related *Centaurea* species and their hybrid swarms, their diversity in space, their changes with time and the factors upon which these are dependent, cannot fail to be of significance for all students of plant life."

The Preface (pp. ix–xiii) consists largely of acknowledgements and explanation of special terms and symbols used throughout the text ; it concludes with a key to the species recognised by the authors and a full

* British Knapweeds : a study in synthetic taxonomy. By E. M. Marsden-Jones and W. B. Turrill, with a Foreword by Sir Edward J. Salisbury, C.B.E., D.Sc., LL.D., Sec.R.S., F.L.S., V.M.H. pp. xiii + 201, illustrated by 16 line drawings and 1 coloured and 26 black and white photographic plates by G. Atkinson. Published by the Ray Society (Vol. No. 138), London, Nov. 1954. Price 27s. 6d. (Sold by Bernard Quaritch Ltd., 11, Grafton St., New Bond Street, London, W.1.).

page of beautiful line drawings by G. Atkinson of six different kinds of disc florets. If any criticism is possible, it is that these latter matters should have been included in the body of the text. It is here that an important new tool is introduced and described—the Index of Hybridity, a concept which might well be applied to many populations in which great variability leads one to suspect the presence of " hybrid swarms ". (It is unfortunate that this term is omitted from the index and from the glossary). Here too is stressed the importance of accurate colour comparisons ; the authors used the Ridgway system, but it is not suggested that this system should or could be applied in all similar problems.

Chapter I is labelled " General Introduction " and in it the authors outline the theoretical and practical considerations which led them to undertake the work, the methods they have employed, which have been modified over the long period—more than twenty years—during which they have been jointly concerned with this and other problems. It is aptly summarized in the authors' own words concluding the chapter on p. 12 :—" Synthetic taxonomy, as we show for the knapweeds in the body of this book, unites herbarium and library studies, field work, laboratory research, and breeding ground experiments. What more can one want ? "

Chapter II, " Taxonomic History of British Knapweeds " gives a clear and concise account, not only of the history of the taxonomy of the British knapweeds, but of the authors' assessement of the value and accuracy of their predecessors' work from pre-Linnean times until the decade 1920 30, when they commenced their critical examination of C. E. Britton's work which inspired them. Their patient examination of all the previous work and their application of their own results in the search for significant phrases and even words in the older, often inadequate, descriptions, in order to typify the taxa they recognise and thereby give stability to their nomenclature, is to be recommended as a model of what such work should be.

Chapters III to V deal with " Vegetative characters ", " Vegetative multiplication and sexual reproduction "—including germination and seedling characters (and here Mr. Atkinson's drawings of germinating cypselas must be the best of their kind ever published),—and " Wild populations ". The last gives in detail the localities in which the authors severally and together studied the plants in the field. These chapters provide the background against which the genetical experiments described in Chapter VI (pp. 83-145) were designed and carried out. This long chapter constitutes the " reference " portion of the book ; it would be foolish to pretend that it is " readable ". Throughout it is a factual statement of what was done and the results that were obtained ; it is clear that there has been no " cooking " or " fiddling " of results to tally with preconceived ideas, and the authors' modesty and humility is reflected in their comment on one of their experiments (p. 145) :—" With a total of 575 plants this is a very pleasing check on the accuracy of the crossing and selfing methods used ".

" Genetics of reproductive parts " and " Compatibility and incompatibility " are the titles of chapters VII and VIII and here to some extent the authors, whilst retaining the factual nature of Chapter VI,

return to the easy readable style of the earlier chapters. Both chapters are natural sequels to Chapter VI, and though Chapter VIII contains a number of difficult tables and diagrams, the discussion and explanations make their purpose and significance clear.

The greater part of the book is concerned with *Centaurea nigra*, *C. nemoralis* and *C. jacea* and the complex swarms arising from their interfertility ; chapter IX—a short one,—deals with the authors' experiments involving *C. scabiosa* and *C. aspera*. These two species do not hybridize with the other three in wild populations, and the authors found that the sterility barrier between them is maintained under cultural conditions.

Chapter X is a statement of " Conclusions " and is in fact a brief summary of the effect of the conclusions stated in each section of the book.

The book concludes with a short glossary of the special technical terms used, together with technical terms used in a special or restricted sense, and an exhaustive general index followed by an index to selfings and crossings. The last is extremely important, since it enables the reader to refer back to the original scoring given in Chapter VI from any reference elsewhere to the same family. There is no formal bibliography, but full references are always given at the appropriate places in the text.

Mr. Marsden-Jones and Dr. Turrill have been associated in the field of experimental taxonomy for more than a quarter of a century, and Dr. Turrill by his various writings may be called a leader in this field who has inspired a new generation as well as a new field of enquiry. The two authors are to be congratulated on the quality of their friendship, which has produced such a notable result. The importance of their book lies not so much in the elucidation of one particular problem as in the reminders and warnings it implies. Such work cannot be completed in less time than several years ; the kind of problem for which a solution is sought is not to be undertaken by a post-graduate student as a short cut to Ph.D. They emphasize the need for extensive as well as intensive study ; their samples were large and numerous ; their breeding trials and transplant experiments were as large as space and labour permitted. Here was no confinement to selected families derived from specially selected parents ; they studied populations, not individuals, and their samples were large enough to be truly random. The time and labour expended, and the patient " scoring " of many thousands of individual plants is briefly dismissed by the authors ; they regarded it as one of the features inherent in the solution of their problem. At the same time they have been engaged upon their classic researches on species of *Silene*, *Ranunculus ficaria* and other problems, whilst Dr. Turrill has also been much preoccupied with official duties. The brilliant outcome of their labour is a comparatively small book, but there is no doubt that it is already a classic. The last sentence of the book (p. 190) expresses their hope that their labour has not been in vain ; they may be assured that it will remain an inspiration for many years to come :—" If our work with the British knapweeds, by illustrating the numerous interesting possibilities of synthetic taxonomy, leads to researches along corresponding, but improved, lines by our younger colleagues we shall be satisfied."

A. A. Bullock.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : LVII.*

Studies in Bignoniaceae, XX.

N. Y. Sandwith

The following notes and descriptions constitute my twentieth published contribution to the study of the *Bignoniaceae* of Tropical America. References to the previous and un-numbered contributions will be found in Kew Bull. 1953, p. 452 (1954), while the nineteenth is my account of this family for the Flora of Trinidad and Tobago which is now in the press.

I am much indebted to the authorities of the herbaria of the Vienna Natural History Museum and Oxford University for the loan of specimens ; to Dr. E. Asplund (Stockholm), Dr. H. García-Barriga (Bogotá) and Dr. P. Raulino Reitz (Herbário " Barbosa Rodrigues ", Itajaí, Santa Catarina), for valuable consignments for study ; and to Prof. G. Erdtman, for his examinations, descriptions and duplicate slides of pollen-grains.

Unless otherwise stated, the specimens cited are in the Kew Herbarium.

Tabebuia roseo-alba (*Ridley*) *Sandwith*, comb. nov.—*Bignonia roseo-alba* Ridley in Journ. Linn. Soc., Bot. 27, 52 (1890). *Tecoma odontodiscus* Bur. et K. Schum. in Mart. Fl. Bras, **8,** pars 2, 320 (1897). *Tabebuia odontodiscus* (Bur. et K. Schum.) Toledo in Arquiv. Bot. Estado São Paulo, **3,** 32 (1952), cum descr. ampl. *Tecoma odontodiscus* Bur. et K. Schum. var. *paraguariensis* Hassl. in Fedde Rep. Spp. Nov. **9,** 60 (1910). *Tecoma piutinga* Pilger in Engl. Bot. Jahrb. **30,** 196 (1901). *Tabebuia piutinga* (Pilger) Sandw. in Lilloa, **14,** 136 (1948). *Tecoma papyrophloios* K. Schum. in Mart. Fl. Bras. l.c. 411. *Tabebuia papyrophloios* (K. Schum.) Melchior in Notizbl. Bot. Gart. Berlin, **13,** 500 (1937).

Distr. Fernando Noronha. Brazil, widely distributed but absent from " Hylaea ". Paraguay. Bolivia (Dept. Santa Cruz, *Steinbach* 6452, as to the flowers).

After examining the type collection I have no hesitation in uniting Ridley's species, of Fernando Noronha, with the three or four taxa which I am placing in the synonymy as above, Ridley's epithet being the earliest. Characteristics of this tree are the scaly indumentum of the vegetative parts and the calyx ; the trifoliolate leaves with leaflets bearded-woolly in the axils of the main nerves beneath ; the small to medium-sized calyx (usually 0·5–1·5 cm., but sometimes reaching 2 cm.) with lobes bearded-woolly at the tip and along the margin within ; the corolla white to pink or purple with yellow blotches on the lower lip, with some scattered scales on the outer surface (especially on the tube beneath the lobes) and with the lobes ciliate and more or less pilose within with soft thin hairs which extend down the anterior side of the tube ; and the biseriate ovules with many (20–30) ovules in each series. *T. papyrophloios* appears to be a form or variety with the leaflets velvety-pilose beneath, but connected with the typical form by intermediates, as suggested by Melchior, l.c., and see *Burchell* 7402, from Goyaz, in Herb. Kew. The fruit and seeds have been well described by Toledo, who also

*Continued from K.B. 1953, p. 484 (Jan. 1954).

pointed out the variability in the size and colour of the flowers and described a new variety, *Tabebuia odontodiscus* var. *violascens* Toledo, with a large calyx and a large violet corolla, the taxonomic value of which I cannot estimate.

In spite of Ridley's very unsatisfactory original description (the *lepidote* indumentum of the leaflets and calyx was not properly defined), and in spite of Schumann's comment that the biseriate ovules of *T. odontodiscus* were abnormal for a species of *Tecoma* (i.e. of *Tabebuia*), the affinity of this species is quite evident. It is with *Tabebuia insignis* (Miq.) Sandwith (*T. albiflora* Ducke) of Guiana, Brazil, and Venezuelan " Hylaea ", which shares many of its leading characters including the biseriate ovules, but is invariably distinguished by the absence of woolly tufts both in the axils of the main nerves on the lower surface of the leaflets and along the margins of the calyx lobes. The leaves of *T. insignis* also are commonly 5-foliolate, while the inflorescence is usually looser and larger (less umbelliform), the calyx usually larger, and the corolla always white. A specimen from Catinga Calderão, Bahia, collected by Ule (no. 7266) and now in the Berlin Herbarium, is apparently a form of *T. roseo-alba* with very young unifoliolate leaves. Schumann's suggestion that the capsule of *T. odontodiscus*, when discovered, might tip the scale for the transference of the species to another genus has not been borne out : the capsule and seeds of *T. roseo-alba*, as described by Toledo for *T. odontodiscus*, and as shown by *Ule* 7266 in the Berlin Herbarium, are very similar to those of *T. insignis*.

When this genus is finally revised, it may well be shown that *Tabebuia elliptica* (DC.) Sandwith in Candollea, **7,** 253 (1937) must be united with *T. insignis*, in the event of which the former name will take precedence. But until I can re-examine the Blanchet (Bahia) specimen of *T. atrovirens* (DC.) Standl. in the De Candolle Herbarium I do not feel justified in proposing this union. It does seem clear, however, that specimens agreeing with *T. insignis* can be found outside " Hylaea ", for instance, in Minas Gerais, Goyaz and Matto Grosso, while the Kew specimen of what is apparently the type collection (coll. *Sellow*) of *T. elliptica* certainly suggests a form of *T. insignis*, but no corolla is present.

Delostoma lobbii *Seem.* in Bonplandia **10,** 72 (1862).—*D. vargasii* Standley ex Vargas, Diez Años servic. Bot. Univ. Cuzco, 47 (1946), nomen tantum ?

This very distinct species, with narrowly tubular-funnelshaped corolla-tube and exserted stamens and style, is variable in the indumentum of the branchlets, leaves and calyx, which may be almost woolly-pilose on the lower surface of the leaves, but is sometimes completely absent from all these parts. The indumentum of the corolla, both on the tube and the lobes, is also variable, being very dense and obvious in specimens from Ecuador, at the north of the range of the species, but relatively weak and inconspicuous in its southern localities in the Dept. of Apurimac, Peru (where the indumentum of the leaves may be very dense, or absent). Again, the leaves vary in shape and size. Surely we must expect a good deal of variation in this shrub, which occurs between 1000 and 2600 m., no doubt in many kinds of situation. The fruit and seeds may now be

described, from the material of *Weberbauer* 5879 : capsule elliptic-oblong, apparently not beaked-attenuate at the apex, 5–5·5 cm. long, about 2 cm. broad, smooth, drying black and glabrous except for minute scales ; seeds transversely elliptic, up to 1·7 cm. long and about 2·3 cm. broad, with dark brown and shining embryo and much paler brown, membranous wings. I should refer the following specimens in the Kew Herbarium to *D. lobbii* :

Ecuador. Prov. Loja : *E. André* 4316 ; on very dry soil between Zaruma and Loja, *W. H. Camp* E. 647 ; Las Chinchas, scattered among *matorrales*, *R. Espinosa* 1610 ; between El Tambo and La Toma, *Hitchcock* 21342 (photograph of specimen in New York Herb.).

Peru. Dept. Amazonas : Chachapoyas, *Lobb* (type) ; Marañon Valley above Balsas, *C. Sandeman* 20, see Sandeman, " A Forgotten River ", 252 (1939). Dept. Apurimac : Abancay, *R. Pearce* ; Prov. Abancay, Jesus y Maria, 3 km. from Quebrada Honda, rocky slope, *C. Vargas* in *Univ. Calif. Second Exped. to Andes* 9608 (identified in 1940 by P. C. Standley as *D. dentatum* Don) ; Prov. Andahuaylas, left bank, valley of Rio Apurimac between its tributaries Rio Pachachaca and Rio Pampas, in high grass-steppe with shrubs, also lower down in savanna, 1800–2600 m., *A. Weberbauer* 5879, see Weberbauer, " El Mundo Vegetal de los Andes Peruanos ", 412 (1945).

The corolla has been variously noted as red, purple, deep rose-pink, claret-coloured or crimson ; that of the specimens from Apurimac is described as red or scarlet, orangewithin, or light yellow within the throat.

I have seen no specimens of the plant which has been named *D. vargasii*, without a description, but as Vargas's isotype came from the province of Abancay, Dept. Apurimac, at 1200 m., it is likely to agree with one of the southern forms of *D. lobbii*.

Jacaranda praetermissa *Sandwith*, sp. nov. ; Sect. *Monolobos* DC., *J. brasilianae* (Lam.) Pers. atque *J. decurrenti* Cham. affinis, ab ambabus foliorum pinnis paucioribus, forma foliolorum oblonga vel elliptico-oblonga apice demum saepius rotundata vel obtusa basi rotundata cordatula neque decurrente, capsula multo minore differt ; praeterea ab illa forma loborum calycinorum, ab hac statura statim distinguitur.

Frutex vel *arbor* parva, ramulis annotinis glabris hornotinis inferne dense puberulis superne velut foliis ubique inflorescentiisque pilis albidis patulis inaequalibus dense villosulo-pubescentibus. *Folia* impari- vel pari-bipinnata, 10–20 cm. longa, matura 10–16 cm. lata, internodiis rhacheos vulgo 2–3 cm. longis supra canaliculatis exalatis vel levissime subalatis, pinnis 4–7-jugis supra profunde canaliculatis ac angustissime alatis ; foliola imparipinnatim 5–10 (–13)-juga vel in pinnis imis nonnunquam 1–4-juga tantum, oblonga vel elliptico-oblonga vel terminalia obovato-elliptica, matura apice saepius rotundata vel saltem obtusa mucronata basi sessilia rotundata distincte cordatula neque decurrentia, 0·4–1·8 cm. longa, 0·3–0·8 cm. lata, terminalia saepius majora ad 3 cm. longa ad 1·2 cm. lata, matura coriacea marginibus revolutis, supra subbullata breviter pilosula nervis canaliculato-immersis vel nonnunquam venuliscum intricate reticulatis prominulis, subtus pallidiora grisea pilis longioribus plus minusve villosula nonnunquam sublanata costa nervis

venulis laxe reticulatis prominulis. *Inflorescentia* apice ramulorum hornotinorum terminalis, 5–10 cm. longa, 5–8 cm. lata, igitur foliis brevior, indumento pilorum inaequalium villosulo praedita ; bracteae inferiores elliptico-lanceolatae vel elliptico-ovatae, acuminatae vel cuspidatulae, imae primariae petiolatae, 4–7 mm. longae 1–5 mm. latae, superiores gradatim breviores ac angustiores ; pedicelli 3–7 mm. longi. *Calyx* profunde basin versus divisus, villosulus, lobis lanceolatis vel oblongo-lanceolatis apice obtusis vel acuminatis inaequalibus 2·5–4·5 mm. longis 1–2·3 mm. latis plus minusve longitudinaliter 5-nerviis atque reticulato-venosis post florem lapsum accrescentibus. *Corolla* caeruleo-violacea, ad 4 cm. (vel applanata ad 5 cm.) longa ; tubus more generis basi circa ovarium inflatus tum breviter anguste cylindricus extra pilis crebris rectis hyalinis apice glanduliferis ad 0·3 mm. longis praeditus, tum campanulato-infundibuliformis apice ad 2 cm. latus pilis similibus multo sparsius indutus glabrescens, intus antice superne pilis longis tenuibus praeditus ceterum glaber ; limbus expansus circiter 3–3·5 cm. diametro, lobis extra praesertim margines versus pilosulis intus glabris. *Stamina* circiter 7 mm. supra tubi basin inserta, sigmoideo-curvata, longiora 1·5 cm. breviora 1·2 cm. longa, filamentis basin versus glanduloso-pilosulis ceterum glabris, antheris monothecis theca fertili 2·5 mm. longa sterili calcariformi 0·5 mm. longa ; staminodium 2 cm. longum, dimidio inferiore glabrum superiore pilis flexuosis apice glanduliferis barbato-villosum. *Discus* pulvinari-cupulatus, carnosus, circiter 1 mm. altus, ab ovario manifeste discretus eoque latior. *Ovarium* ovoideum, glabrum, 2 mm. diametro ; stylus glaber, stigmatibus inclusis 2·2 cm. longus. *Capsula* parva, suborbicularis, apice late leviter emarginata, basi aliquantum attenuata, 2·2–3·2 cm. longa, 2·2–2·7 cm. lata, valvis laevibus glabris costa mediana nulla ; semina transverse elliptica, 1 cm. longa, 2 cm. vel paulo ultra lata, embryone pallide flavo-brunnea rugosula, alis latis membranaceis hyalinis.

Brazil. Piauhy : Serra Branca, tree or shrub 1–5 m. high, flowers bluish-violet, Jan. 1907, *Ule* 7479 (type in Kew Herb., isotype in Berlin Herb.), *ibid.*, fr. Jan. 1907, *Ule* 7176 (Kew Herb., Berlin Herb.) ; near Pedro Segundo, fls., 1935, *Dahlgren* 874, distributed as *Jacaranda brasiliana* Pers. Bahia : Serra do Matto Grosso (N. of Rio Preto, and only 5–10 miles south of the boundary between Bahia and Piauhy), a shrub 6 ft. high, flowers and very young leaves, Sept. 1839, *Gardner* 2918 (Kew Herb.).

A very well-marked species on account of the few leaf-pinnae, the shape of the leaflets, the narrow calyx lobes and the small capsules. It seems to occupy a taxonomic position between *J. brasiliana* and *J. decurrens*, and has been confused with the former, which has very different leaves, short and broadly ovate, often reflexed calyx lobes, and much larger fruits. *J. decurrens*, which is a very low-growing sub-shrub with distinctive decurrent leaflets, also has much larger fruits (according to Schumann's supplementary description in Mart. Fl. Bras. **8,** pars 2, 414), while its ovary is more or less continuous with the relatively narrow disk. It occurs in Southern Brazil and Paraguay. *J. praetermissa*, on present evidence, has a restricted distribution in north-eastern Brazil, whereas *J. brasiliana* ranges widely from the States of Pará and Maranhão in the north to that of Rio Grande do Sul in the south.

Lundia gardneri *Sandwith*, sp. nov. ; sectionis *Lundiae*, *L. corymbiferae* (Vahl) Sandwith et *L. damazii* C.DC. ut videtur affinis, ab ambabus indumento denso partium hornotinarum passim patenter vel patule pilosulo vel in foliolis lanato, inflorescentiis apice ramulorum corymbose congestis densifloris, corollis roseis, calycis rostro apicali insigniter longo conspicuo facile distinguitur ; praeterea ab hac calyce circumscissiliter rupto neque spathaceo-fisso differt.

Frutex scandens, ramulis hornotinis petiolis petiolulis foliolis inflorescentiis pilis simplicibus mollibus passim dense patenter vel patule pilosulis scilicet plus minusve lanato-villosulis, annotinis defoliatis glabrescentibus furfuraceo-puberulis striatis lenticellatis siccitate purpurascentibus, consociebus glandularum in nodis manifestis ; pseudostipulae scariosae tantum parvae ovatae, nullae foliaceae. *Folia* ramulorum hornotinorum tantum visa, 2–3-foliolata, cirrho nullo viso, 3–8 cm. longa, passim dense subincano-lanato-villosula ; petiolus ad 2·5 cm. longus ; petioluli laterales 3–7 mm. longi, terminalis ad 1–3 cm. longus ; foliola siccitate saltem plicata, ovata vel terminalia obovato-elliptica, apice acute vel breviter acuminata, basi rotundata cordatula, ad 4·5 cm. longa, ad 2·8 cm. lata, firme chartacea, ob indumentum supra descriptum tactu velutina, praesertim subtus pallidiora atque magis lanata, costa nervis primariis venulis supra vix obviis subtus manifestis. *Inflorescentiae* apice ramulorum plures congestae, igitur thyrsum corymbosum valde densiflorum ad 6 cm. longum ad 11 cm. latum efformantes, ubique pilis albidis vel flavescentibus patenter sublanato-villosulae ; bracteae bracteolaeque setaceae, illae ad 6 mm. longae, hae breviores ; pedicelli breves, vulgo circiter 3 mm. longi. *Calyx* membranaceus, siccitate brunneus, molliter villosulus, alabastro ellipsoideus vel ellipsoideo-pyriformis 7–10 mm. longus 4·5–6 mm. latus superne in rostrum angustum conspicuum apice lobis 5 setaceis ad 2 mm. longis terminatum his inclusis 3·5–6 mm. longum contractus, demum juxta medium circumscissiliter ruptus parte relicta more generis turbinato-campanulata truncata 5–6 mm. longa. *Corolla* teste lectore rosea, infundibularis, membranacea, 3·5–4·5 cm. longa, tubo extra dense adpresse pubescente intus glanduloso-lepidoto, limbo 2·5–3 cm. diametro lobis rotundatis utrinque praesertim extra pubescentibus. *Stamina* filamentis glabris, antherarum thecis 3·5–4 mm. longis lanato-villosis. *Ovarium* ovoideum, tomentosum ; stylus basi excepta glaber, 2 cm. longus, stigmatibus ovatis apice rotundatis 2 mm. longis ; ovula in quoque loculo 4-seriata, in quaque serie circiter 10. *Fructus* non visus.

Brazil. Piauhy ; banks of the Rio Parahim (N. of Parnaguá and S. of Gurgueia), Sept. 1839, *Gardner* 2678 (type in Kew Herb., isotypes in Herb. Brit. Mus. and Oxford Univ. Herb.). " A climber. Flowers pink."

Only the young leaves of young branchlets of the year are present with the material, and it is possible that old leaflets—if they ever materialise, on a plant with this habit, in such a habitat—may show a much weaker indumentum or even glabrescence. The measurements of the fully developed stamens are not given because the mature corollas were all firmly gummed to the sheet or had been damaged by insects.

This is a very distinct species on account of the indumentum of soft spreading hairs on all the younger vegetative parts and on the inflores-

cences, which are peculiarly dense and corymbose at the apex of the young branchlets. The unusually long narrow calyx beak, tipped with 5 narrow lobes, is an important character by which this plant approaches *L. damazii* C.DC., but in that species the beak is shorter (2 mm. or less) and the calyx is spathaceously split on one side, whereas in the present plant the rupture is circumscissile at the middle of the calyx. The ovules of *L. damazii* were described as 2-seriate. The setaceous bracts and bracteoles, the pink corollas with rounded lobes, and the 4-seriate ovules, are further noteworthy characters of Gardner's outstanding new species.

Petastoma truncatum (*Sprague*) *Hassler* in Fedde Rep. Spp. Nov. **9,** 53 (1910).—*Mansoa truncata* Sprague in Bull. Herb. Boiss. sér. 2, **5,** 83 (1905) ; Urb. in Ber. Deutsch. Bot. Ges. **34,** 745 (1916).

Distr. Paraguay, N.W. Argentina (Provs. Salta, Tucumán, Santiago del Estero), Bolivia (Dept. Santa Cruz).

This species, as both Hassler and Urban saw, must be rejected from *Mansoa* on account of its habit, facies, simple tendril and pollen-grains. Hassler transferred it to *Petastoma* and gave an emended and amplified description, dividing the species into two varieties, *parviflorum* and *grandiflorum*, based mainly on the size of the floral parts. Of the two collections originally cited by Sprague, *Hassler* 7482a is var. *parviflorum* Hassl., while *Hassler* 7482 is var. *grandiflorum* Hassl. Hassler considered that Sprague's description was for the most part applicable to var. *parviflorum*. This is not so. It is obviously compounded equally from both gatherings, and the single sheet at Kew contains only a calyx and corolla of 7482a (var. *parviflorum*) which were dissected by Sprague and are kept separate in an envelope, while the excellent material on the rest of the sheet (with large corolla lobes, as in Sprague's description) all belongs to 7482 (var. *grandiflorum*). I now propose that the Kew material of *Hassler* 7482 be selected as the lectotype of this species.

Hassler's emendations and amplifications of the original description were useful, as he brought out the distinct, pointed, cuspidulate nature of the corolla lobes (Sprague merely described them as obtuse), and he also described the fruit and seeds of var. *grandiflorum* from a third collection (*Hassler* 2900c) which was not available to Sprague. Since then, I have seen quite a large series of gatherings of *P. truncatum* from N.W. Argentina and also five collections (*Bourke-Burrowes* 90 and 93, Oct. 1928 ; *Peredo*, sine no., 7.xi.1945 ; *Lobb* 628, and *Pflanz* 2108, Oct. 1923, both in Vienna Nat. Hist. Mus. Herb.) from the Dept. of Santa Cruz, S.E. Bolivia, and can add a few points of interest. The tendril is always simple, and the corolla is always noted as white. The calyx teeth may be nearly or quite 2 mm. long. The capsule may be up to 18·5 cm. long and 1·2 cm. broad, with the valves drying brown and separating early from the replum, sprinkled with minute scale-dots and, at least in age, with small lenticels, their midrib slender and slightly raised. The seeds are up to 9 mm. long and 2·5 cm. broad, uniformly dirty creamy-white or pale yellowish brown when dried, or the embryo somewhat greyish, with the wings not at all hyaline except at their apical extremity. Prof. G. Erdtman has kindly examined the pollen-grains and finds them 3-

colpate (Urban, l.c., described them as 6-rugate). I do not regard Hassler's definition of his two varieties as justified, especially on the evidence of only three collections, and would content myself with observing that his large-flowered form is evidently scarce, or at least rarely collected : with the exception of *Venturi* 1586, from Tucumán, Argentina, which has corolla lobes 2 cm. long, the other specimens seen by me are of the relatively small-flowered type.

After long deliberation and much reluctance I have decided to accept Hassler's transference to *Petastoma* of this very distinct and perplexing species, chiefly because I can find no better position for it, while at the same time detecting in it no character which would justify the creation of an independent genus. In general facies, *P. truncatum* is wholly unlike any other species hitherto placed in *Petastoma*, particularly on account of its calyx and the indumentum of the corolla. But closer inspection reveals very many unsuspected characters which are common to both groups, for instance, in the habit with simple leaves at the base of young branchlets, the absence of gland-fields at the nodes, the simple tendril, the pointed corolla lobes (see *Petastoma samydoides*, etc.), the anther-connective, the pollen-grains, the disk, the biseriate ovules, the capsule and seeds. The evidence for affinity seems overwhelming, and even in the calyx and corolla there are points of linkage, since the calyx of *P. samydoides* and *P. discocalyx* can be seen on examination to be minutely denticulate, while the corolla of *P. discocalyx* is externally pubescent nearly to the base of the tube. The truth is that the calyces of familiar species of *Petastoma* are not at all unlike that of *P. truncatum* in the early stages when they are campanulate, before their margins become rolled outwards to assume a shallowly cup-shaped form. I am therefore inclined to believe, not only that *P. truncatum* is indeed a species of *Petastoma*, but also that we may even postulate an affinity with one of its species, viz. *P. samydoides* (Cham.) Miers of south-central Brazil.

Meanwhile, I have also been concerned with a very remarkable species of *Bignoniaceae* collected in the State of Bahia, Brazil, by E. Ule. For a long time I could not place this with confidence in any genus but eventually, after making my description, I realised that its nearest point of contact was with *Petastoma truncatum*. Once again, the general characters of *Petastoma* are found in this plant, with the addition of some of those seen in *P. truncatum*, but in facies it diverges still further from the familiar species of *Petastoma* on account of the villous, tubular-campanulate calyx which is terminated by long filiform-setaceous teeth. The pollen-grains are tricolpate, just as in *P. truncatum*. The only alternative to regarding it as a species of *Petastoma* was to place it in the poorly defined *Setilobus* Baill., of which the fruit is unknown, but the authentic species of that genus differ wholly from both Ule's plant and *P. truncatum* in the foliaceous pseudostipules, the indumentum of branched hairs and the large, wide bracts, as well as in the facies of the dense, corymbose inflorescence. The description of Ule's plant is as follows :

Petastoma paradoxum *Sandwith*, sp. nov. ; *P. truncato* (Sprague) Hassl. quam speciei alii ulli magis affinis, ob indumentum omnium partium hornotinarum, foliola conspicue acuminata, bracteas bracteo-

lasque longe filiformi-setaceas, corollam lilacinam, dentes calycinos longissimos distinctissima.

Frutex scandens, ramulis annotinis defoliatis teretibus glabris striatis lenticellatis, hornotinis foliiferis floriferisque brevissimis gracilibus e squamis brunneis ovatis acutis vel acuminatis ciliatis exorientibus, pilis albidis patulis crispulis mollibus multicellularibus nonnullis apice glanduliferis dense indutis : consocies glandularum in nodis desunt : pseudostipulae foliaceae nullae. *Folia* hornotina tantum visa, ubique indumento ramulorum praedita, ima par unicum basi ramulorum simplicia parva orbiculari-ovata mucronata vel elliptico-ovata acuta brevipetiolata pseudostipulas foliaceas simulantia sed super petiolis in ramulo ipso evoluta 0·8–1·6 cm. longa ad 1·3 cm. lata, superiora trifoliolata cirrho nullo viso petiolis gracilibus ad 4 cm. longis, petiolulis lateralibus 3–6 mm. longis terminali ad 1·4 cm. longo : foliola ovata, ovato-lanceolata, vel terminalia plus minusve elliptico-oblonga, apice conspicue argute acuminata, basi rotundata vel obtusa, lateralia basi inaequilatera phaseoliformia, ad 4 cm. longa, ad 2·4 cm. lata, tenuiter chartacea vel membranacea, supra satis dense pilosula subtus lanata subvelutina, basi 3–5-nervia, costa nervisque supra immersis obscuris subtus prominulis conspicuis quam pagina longius villosis. *Inflorescentia* apice ramulorum brevis, racemosa vel thyrsoidea ramulis imis trifloris, 2–3 cm. longa, pauciflora, ut videtur 3–9-flora tantum, ubique indumento ramulorum foliorumque molliter crispule villoso-pilosa ; bracteae bracteolaeque setaceo-filiformes, flexuosae, fere ad 1·5 cm. longae : pedicelli 4–8 mm. longi. *Calyx* statu vivo albus, tubuloso-campanulatus vel tubulosus, membranaceus, 7–8 mm. longus, apice 5–6 mm. latus, tenuiter 5-costatus, costis in dentes insignes filiformi-setaceos 5–6·5 mm. longos basi dilatatos atque sinus inter se praebentes excurrentibus, extra passim eodem indumento villoso supra descripto vestitus. *Corolla* teste lectore lilacina, vix 3·5 cm. longa, tubo basi per 5–7 mm. cylindrico glabro tum infundibuliformi apice ad 1·4 cm. lato extra copiose sed haud dense subadpresse crispule pubescenti-piloso intus glabro nisi zona papillarum brevium apice glanduliferarum circa insertionem staminum praedito : limbus circiter 3 cm. diametro, utrinque velut tubus pubescenti-pilosus, lobis circiter 1·2 cm. longis atque latis apice in cuspidem vel mucronem manifestum 1 mm. longum conspicue attenuatis. *Stamina* 7 mm. supra tubi basin inserta, longiora 1·5 cm. breviora 1 cm. longa, filamentis basi excepta glabris, thecis antherarum glabris divaricatis 3–3·2 mm. longis nonnunquam staminum longiorum e corollae fauce exsertis connectivo in appendicem brevem glabram rotundatam obtusam cuspide angusta oblonga terminatam producto : staminodium 3·5 mm. longum. *Discus* conspicuus, pulvinaris, 1 mm. altus. *Ovarium* anguste ellipsoideo-oblongum, supra discum paulo constrictum, 2 mm. longum, 0·8 mm. latum, dense lepidotum, costatum sulcatumque : stylus fere 2 cm. longus, glaber, basin versus sulcatus, stigmatibus brevibus anguste ellipticis vix 0·75 mm. longis carnosis involutis : ovula in quoque loculo biseriata, in quaque serie 5–6. *Capsula* lineari-oblonga, utrinque attenuata ac apice rostrato-acuminata, exempla visa ad 11 cm. longa ac ad 1·2 cm. lata, valvis applanatis siccitate brunneis glabris laevibus satis copiose punctato-lepidotis costa tenuiter elevata : semina immatura tantum visa, embryone fusca glabra, alis membranaceis albido-flavescentibus.

BRAZIL. Bahia : in *catinga* near Tambury, Oct. 1906, *E. Ule* 7067 (type in Kew Herb., isotype in Berlin Herb.). Climber with white calyx and lilac corolla.

The white calyx is yet another well-known character of *Petastoma*. The gland-tipped hairs of the young vegetative parts are found on other species of other genera of *Bignoniaceae* occurring in the *catingas* and *chapadas* of north-eastern Brazil and may be directly connected with factors of habitat and climate.

Clytostoma uleanum *Kränzl.* in Notizbl. Bot. Gart. Berlin, **6,** 374 (1915).

BRAZIL. Territory of Acre : Rio Macauhan (Rio Yaco, Rio Purus basin), fl. Aug. 1933, *Krukoff* 5612. Minas Gerais : Santa Terezinha, Ituiutaba, fl. and fr. Sept. 1948, *A. Macêdo* 1201.

PERU. Dept. Huánuco : Tingo Maria, fl. July 1940, *E. Asplund* 12243 (Stockholm Herb. and Kew Herb.). Dept. San Martin : Juan Jui, Alto Rio Huallaga, in forest, 400 m., fl. Sept. 1934, *G. Klug* 3818 (distributed as a new species of *Adenocalymma*, the name being unpublished).

The above collections share the characteristics of this species, the Berlin type of which (*Ule* 102b. from the Alto Acre, Brazil) I compared with *Krukoff* 5612 in May, 1937. *C. uleanum* seems very distinct on account of the large, well-developed terminal panicle (up to 40 cm. long in *Asplund* 12243) with showy corollas, and the large leaflets. The calyx tends to dry a dark purple colour, and has short and thick, deltoid-acuminate teeth connected by a much paler, purplish-coloured, truncate membrane which is pubescent like the outer surface of the corolla. The flowers are light violet or lilac. The fruit of *Macêdo* 1201 is a large and very distinctive, oblong, echinate capsule 15–20 cm. long and (excluding the prickles) 3–4 cm. broad, with formidable prickles 6–9 mm. long and 5–8 mm. broad at the base. The seeds are 2–2·5 cm. long and 5–6·5 cm. broad, pale brown, and remarkable for the fact that the wing on one side of the embryo is so much reduced as to be almost evanescent and the embryo appears placed at one end of the seed, the wing on the other side being very broad, firmly membranous, pale brown, but bordered with a narrow, membranous, whitish, hyaline margin.

Another collection which may belong here is *Sandeman* 3376 from 1500 ft. at Ganso Azul, Rio Pachitea, Amazonian Peru, collected in Oct. 1942. This has the same showy panicle, but the corollas are much smaller, the calyx teeth are very reduced in size, and the leaflets are conspicuously cordate at the base. It may represent a distinct species, or at least a distinguishable variety of *C. uleanum*, but corroboration is needed.

C. uleanum seems more likely to be related to *C. sciuripabulum* Bur. et K. Schum., the fruit of which is unknown, than to *C. callistegioides* (Cham.) Bur., with which it was compared by Kränzlin.

Cremastus ? grallatorius *Miers* in Proc. Roy. Hortic. Soc. **3,** 187 (1863) ; Bur. et K. Schum. in Mart. Fl. Bras. **8,** pars 2, 218, obs. 2 (1896).

Part of the type material collected by Weir (without no.), consisting only of foliage, is in the Kew Herbarium, having been presented by the Royal Horticultural Society in 1872. On a Weir (without no.) sheet formerly in Hooker's Herbarium there are leaflets exactly matching those of the type material and they are associated on the sheet with detached branchlets and inflorescences which match those of the leafless sheet of *Weir* 54 which was also presented by the Royal Horticultural Society in 1872. Now *Weir* 54 is the "*Cydista*, sp., sine foliis" of Miers' paper (p. 191) in which he described *Cremastus grallatorius*, and these words are written on the Kew sheet of this number. I suspect that the leaflets which Miers described as *C. grallatorius* had become accidentally detached from the flowering material of no. 54, before he received the consignment of specimens for identification. At the British Museum Herbarium, the type material (only a single leaf) of *Cremastus* ? *grallatorius* Miers from his own herbarium has been mounted on the same sheet with Miers' specimen of *Weir* 54 (labelled "Cydista sp. ignot. Proc. Hort. Soc. iii. 191", and provenance given as "Belem, prov. Rio Janeiro".)

There is no doubt at all that the leaflets can, and almost certainly should, be associated with the inflorescences. Together they show that Miers' *Cremastus* ? *grallatorius* was a species of Sprague's genus *Xylophragma* with very young trifoliolate leaves with narrow leaflets. Judging by the number of leaflets, one would be inclined to refer Miers' species to *X. pratense* (Bur. et K. Schum.) Sprague, rather than to the very closely allied *X. myrianthum* (Cham.) Sprague and the recently described *X. heringianum* Toledo, both of which normally have 5-foliolate leaves. But further collecting is needed before these three taxa in *Xylophragma* can be properly defined in relation to each other and, in any case, Miers' description of *Cremastus* ? *grallatorius* is wholly inadequate for the definition of any species of this family, and his name should surely never be used, even if it is found to antedate that of a properly defined species to which his type material can be confidently referred.

Cuspidaria argentea (*Wawra*) *Sandwith*, comb. nov.—*Arrabidaea argentea* Wawra in Oesterr. Bot. Zeitschr. **29,** 216 (1879) ; Bur. et K. Schum. in Mart. Fl. Bras. **8,** pars 2, 22 (1896). *Blepharitheca argentea* (Wawra) M. Pichon in Bull. Soc. Bot. France, **92,** 224 (1945).

Examination of a photograph (Chicago Nat. Hist. Mus. Negative no. 32850) of the type specimen in the Vienna Natural History Museum Herbarium has confirmed my realisation, from reading the description in the Flora Brasiliensis, that this species is a *Cuspidaria*. The matter is clinched by the obvious agreement with it of three other collections, all from the same state of Piauhy in which Schwarz collected the type specimen of *Arrabidaea argentea*. These are *Gardner* 2242, a gathering with fully ripe fruit and seeds, from Oeiras, in May 1939 (2 sheets in Kew Herb., 1 sheet in Herb. Brit. Mus. and Oxford Univ. Herb.) ; *Ule* 7478, flowering material, from *catinga* of the Serra Branca, Jan. 1907 (Kew Herb. and Berlin Herb.) ; and *Ule* 7477, with young fruit, from the Serra Nova, Jan. 1907 (Kew Herb. and Berlin Herb.). The fruits of these gatherings have the very distinctive wings peculiar to the genus *Cuspidaria*. But even apart from the fruits, the curved and pilosulous anther thecae (see t. 82 of the Flora Brasiliensis), and the calyx, are also

characteristic of that genus as very properly restricted by Urban in Ber. Deutsch. Bot. Ges. **34,** 742 (1916). The presence of gland-fields at the nodes should also be noted.

Recently, M. Pichon created a new genus *Blepharitheca* for two species with such anthers and calyx, and with the pollen-grains in tetrads (as in *Cuspidaria* !). These species are *Arrabidaea subfastigiata* and *A. puberula* of Bureau and Schumann's account in the Flora Brasiliensis, each of which apparently (according to these authors and M. Pichon himself) has a narrow, elongate-linear, unwinged capsule like that of *Arrabidaea*. M. Pichon also referred *A. argentea* to *Blepharitheca*, although he had seen no material. The Kew Herbarium possesses no fruits of *A. subfastigiata* (= *A. rubricaulis* Miers) and *A. puberula*, so I cannot solve this mystery : but it is indeed odd if species such as these and *A. argentea*, which resemble each other so closely in other characters, have such very dissimilar fruits. The inference is that perhaps the presence or absence of broad wings on the capsule is an adaptive character which is only of specific, not generic, significance. In this event, all the species of M. Pichon's genus *Blepharitheca* will have to be transferred to *Cuspidaria*. Incidentally, M. Pichon's suggestion (l.c., p. 228) that *Cuspidaria* DC., being a later homonym of *Cuspidaria* Link, must be replaced by *Nouletia* Endl., was unnecessary, since it is conserved against both names on the list of Nomina Generica Conservanda.

The ripe fruits and seeds of *C. argentea* may now be described from Gardner's specimens of his no. 2242 : *capsula* pro rata brevis atque lata, elliptico-oblonga, ob alas utrinque rotundato-emarginata ; valvae lateraliter alatae, alis inclusis 8·5–10 cm. longae, 4·5–5·5 cm. latae, laeves, glabrae, maturitate in statu sicco brunneo-glaucescentes, alis ipsis ad 1·8 cm. latis margine conspicue crispatis ; *semina* satis breviter lateque transverse oblonga, circiter 1·6 cm. longa, vulgo 2·5–2·8 cm. lata, corpore siccitate castaneo-brunneo glabro, alis membranaceis albidis hyalino-nitentibus satis angustis parte hyalina vulgo circiter 5 mm. lata.

Stizophyllum inaequilaterum *Bur. et K. Schum.* in Mart. Fl. Bras. **8,** pars 2, 221 (1896).

I have seen the following collections of this taxon, which is well characterized by the long, soft, golden-brown hairs on all parts, becoming dense and woolly on the branchlets, tendrils, inflorescences, calyx and corolla :

Colombia. Boyacá ; El Humbo, in high forest, 3,000 ft., fl. Feb. 19th 1933, *A. E. Lawrance* 620. I compared this, in Sept. 1936, with the type specimen (*Poeppig* 1827) in the Berlin Herbarium, which is now destroyed.

Ecuador. Napo-Pastaza ; Archidona, fl. Oct. 1939, *Asplund* 9507 (Stockholm Herb.), and between Tena and Archidona, fl. Jan. 1940, *Asplund* 10229 (Stockholm Herb. and Kew Herb.). Santiago-Zamora ("Oriente") ; valley of Rio Upano, uplands at 1950—2200 ft., fl. Dec. 1944, *W. H. Camp* E.1432.

Peru. Maynas, *Poeppig* 1827 (photograph of Vienna Nat. Hist. Mus. Herb. isotype, Chicago Nat. Hist. Museum Neg. No. 32877).

As usual, there is much variation in the size, shape and toothing of the leaflets. It is quite possible that *S. inaequilaterum* is not more than an indumentum variety of a very variable collective species *S. riparium* (H.B.K.) Sandw., which will also include the well-known *S. perforatum* (Cham.) Miers.

Anemopaegma chrysanthum *Dugand* in Caldasia, **4,** 307 (1947).

Ecuador. Esmeraldas ; Esmeraldas, riverside, 20 m., fl. August 1947, *G. Harling* 1722 (Stockholm Herb.). Los Rios ; Hacienda Clementina, roadside, 30 m., fl. Jan. 1947, *G. Harling* 241 (*ibid.*).

Distr. Pacific coast of Colombia.

Apparently the first records from Ecuador. Salient characters are the shiny corky covering of the ribbed branchlets ; the glabrescence or complete glabreity of all vegetative parts ; the broad nodes with conspicuous expansions at the bases of the branchlets and leaves ; the absence of foliaceous pseudostipules, which are replaced by very small triangular-ovate scales ; the long petiolules ; the trifid tendril ; the very intricately reticulate glabrous leaflets with strongly prominulous veinlets, especially on the upper surface ; the nearly glabrous calyx, which is minutely ciliolate on the upper margin ; and the glabrous exterior of the corolla tube.

In addition to the Colombian localities given by Dr. Dugand, this species occurs on the island of Gorgona, *St. George Expedition* nos. 338 and 521, ann. 1924, and was collected at Cupica, Choco, in 1848 by *Seemann*, no. 1085.

Pseudopaegma insculptum *Sandwith*, sp. nov. ; *P. oligoneuron* Sprague et Sandwith affinis, foliolis minus late ovatis fere omnino glabris, nervis secundariis venulisque utrinque praesertim supra insculpto-impressis, corollae lobis extra minute puberulis differt.

Frutex scandens, ramulis petiolis petiolulis dense minute puberulis necnon glanduloso-lepidotis ; consocies glandularum in nodis inter petiolos manifestae ; pseudostipulae foliaceae nullae. *Folia* bifoliolata, cirrho unico integro viso apice simplici ; petiolus 3–5 cm. longus, petiolulis 1·5–2 cm. longis ; foliola ovata (haud late nec orbiculari-ovata), apice acuta vel breviter acuminata apice ipso nonnunquam obtuso mucronato, basi late rotundata vel subtruncata, 10·5–15 cm. longa, 6·5–8·5 cm. lata, coriacea, laevissima (haudquaquam subbullata), utrinque omnino glaberrima vel costa supra minute puberula, utrinque praesertim subtus punctato-lepidota lepidibus in foveis insidentibus, costa nervisque primariis utroque latere 7–9 supra planis subtus prominentibus, nervis ceteris cum rete venularum subtili utrinque praesertim supra insculpto-impressis, pagina superiore tota sub lente intricatissime rugosula. *Inflorescentia* axillaris, ei *P. oligoneuron* persimilis, brevis, multiflora, ubique dense crispule puberula, bracteis bracteolisque similibus ; pedicelli ad 1·2 cm. longi. *Calyx* late campanulatus, 5 6 mm. longus, apice ad 9 mm. latus, satis tenuis, tenuiter longitudinaliter multivenosus, extra minute papilloso-puberulus atque glanduloso-lepidotus, margine sinuato-truncato minute (ad 0·5 mm.) denticulato ciliolato. *Corolla* laete lutea, forma eius *P. oligoneuron*, 4–5 cm.

longa ; tubus parte basali 1·5 cm. longa angusta cylindrica tum ampliatus apice ad 1·6 cm. latus, extra glaber, intus sub insertione filamentorum per zonam 4–5 mm. longam papillis apice glanduliferis dense indutus ceterum glaber ; limbus 2–2·5 cm. diametro, lobis ciliolatis extra praesertim prope margines pubescentibus et glandulis patelliformibus nunc paucis sparsis nunc compluribus plus minusve in consocies aggregatis praeditis intus minute glanduloso-lepidotis necnon margines versus pubescentibus. *Stamina* longiora 2 cm., breviora 1·6 cm. longa ; antherarum thecae divergentes, 2·5 mm. longae ; staminodium 8 mm. longum. *Discus* pulvinatus, 1 mm. altus. *Ovarium* ellipsoideum, compressum, supra discum constrictum, dense lepidotum, circiter 2 mm. longum atque 1·5 mm. diametro ; stylus glaber, 2·8–3 cm. longus ; ovula pro loculo circiter 6-seriata, ovulis pro seriebus medianis ut videtur 5–6. *Fructus* non visus.

Colombia. Amazonas : La Pedrera, Rio Caquetá, 240 m., Oct. 1952, *H. García-Barriga* 14617 (type in Kew Herb., distributed from Herb. Nac. Colombiano) ; climber over tall trees, flowers bright yellow, calyx yellowish green.

Brazil. Guaporé : Guajará-Mirim, 500 ft., August 1942, *C. Sandeman* 2182 ; " scandent plant, very floriferous, with clusters of brilliant yellow flowers without perfume, growing in semi-shade and full exposure."

Closely allied to *P. oligoneuron*, which is known from Colombia (Sierra de la Macarena) and British Guiana, but strikingly distinct on account of the less broadly ovate, wholly or almost wholly glabrous leaflets with very smooth-looking surfaces on which most of the nerves and all the veinlets are intricately impressed, so that these surfaces appear shagreened under a lens, just as in *Anemopaegma parkeri* Sprague, *Distictella racemosa* (Bur. et K. Schum.) Urb. and *Martinella insculpta* Sprague et Sandwith. The corolla lobes are minutely puberulous on the outer surface, not glabrous as in *P. oligoneuron*. These characters, found in combination in two collections from widely separated localities, suggest a taxon which deserves more than varietal rank until further observations prove otherwise.

The single unbroken tendril on the type specimen appears to be simple at the apex. The tendril of *P. oligoneuron* was described as simple or forked, and subsequent examination shows that it is usually trifid, but two collections give evidence of apparently simple tendrils although on one of these both trifid and simple tendrils are borne on the same branchlet. Further observations are needed on the tendrils of the genus *Pseudopaegma*: the very tender tip is easily broken off, or the arms may sometimes develop late. The tendrils of this genus are no doubt trifid at the apex, as described by Urban ; nevertheless, it is very closely related to *Anemopaegma*, which has both simple and trifid tendrils. An important character distinguishing the two genera is the presence of gland-fields at the nodes of the branchlets of *Pseudopaegma*. This was not noticed by Urban when he described the latter genus, but they are obvious at the puberulous or glabrate nodes of *P. longidens*, *P. oligoneuron* and *P. insculptum*, less easy to observe at the pilose nodes of the three other species.

A key to the six known species of *Pseudopaegma* may now be provided as follows :—

Pseudostipules foliaceous ; cor. tube glandular-lepidote outside
P. colombianum Sandw.

Pseudostipules not foliaceous ; cor. tube glabrous outside :

Calyx with long, conspicuous, subulate teeth :

Leaflets glabrous, shining, loosely reticulate; cal. teeth 2·5–5 mm. long
P. longidens (DC.) Urb.

Leaflets more or less densely pubescent :

Leaflets exceeding 5 cm. ; pedicels and cal. with simple hairs : cal. teeth less than 1 cm. long
P. jucundum (Bur. et K. Schum.) Urb.

Leaflets small, less than 5 cm. ; pedicels and cal. with gland-tipped hairs ; cal. teeth more than 1 cm. long . *P. mirabile* Sandw.

Calyx minutely denticulate :

Leaflets broadly ovate, pubescent, veinlets not impressed ; cor. lobes glabrous outside . . . . *P. oligoneuron* Sprague et Sandw.

Leaflets ovate, almost wholly glabrous, veinlets impressed ; cor. lobes puberulous outside . . . . . *P. insculptum* Sandw.

The question of the relative values of these putative liana species is a fascinating problem which is quite insoluble by the herbarium taxonomist. Presence, absence and quality of indumentum is likely, more and more, in the future to prove only of varietal significance in *Bignoniaceae* ; while the length of subulate calyx teeth is suspect as a specific character. The impression or prominence of veinlets, in spite of the highly distinctive facies they give to leaflets, may be due to local or individual physiological conditions. The "*catinga*" *Bignoniaceae* of N. E. Brazil bear foliage with small leaflets on young short shoots at the time when collectors gather the flowers, and the presence of gland-tipped hairs and long calyx teeth is also connected with this ecological preference for drier, more open country and deciduous forest. It is conceivable that one day, many years hence, we shall regard *P. mirabile*, *P. jucundum* and *P. colombianum* as locally developed open-country habitat forms, and *P. longidens* as a second-growth "*capoeira*" form, of the high forest *P. oligoneuron* and *P. insculptum*, which may themselves be physiological states of a single species. On the other hand, all six may be proved to be "good" species with constant characters tested by cultivation and transplanting.

Adenocalymma marginatum (*Cham.*) *DC.* var. **apterospermum** *Sandwith*, var. nov. ; a var. *marginato* seminibus exalatis crassis suberosis hilo ambitu pro rata longiore ac angustiore distinguitur, praeterea foliolis apice vix acuminatis vel rotundatis emarginatis necnon valvis capsulae brevibus minus compressis notabilis.

Brazil. Santa Catarina : Rio Tavares, Ilha Santa Catarina, in *restinga*, sea-level, March 11th, 1953, *Reitz and Klein* 300 (fl. and fr., type in Kew Herb.) and 294 (fl., Kew Herb.) ; Praia Braba, Itajaí, in *restinga*, sea-level, fr. May 28th, 1953, *Reitz and Klein* 773 (Herb. "Barbosa Rodrigues") ; Ibirama, river-bank, 100 m., Dec. 13th, 1953, *A. Gevieski* 82 (fl., Kew Herb.). A climber with yellow flowers.

Leaflets rounded and apiculate or emarginate, or very shortly and bluntly acuminate, at the apex. *Capsules* 11–14 cm. long, up to 3·3 cm. broad. *Seeds* wingless, the body pale brown, very thick and corky, irregularly hollowed and ridged, about 1·8 cm. long and 2–2·5 cm. broad, with hilum 2·5–5 mm. long and 1·5–2 cm. broad (the length and breadth being fixed in relation to those of the seed). In other vegetative and floral characters, as in var. *marginatum*.

This is the first occasion on which I have ventured to treat as varieties of one species two taxa of *Bignoniaceae* one of which has winged, the other wingless and corky seeds. Dr. Reitz's collections with wingless seeds come from a small area on the coast of the State of Santa Catarina which is in the middle of the area of distribution of *A. marginatum*. I find no characters in the leaves or inflorescence by which I can distinguish his plant from the range of specimens of the typical variety *marginatum*. The capsule of the variety with wingless seeds is relatively short and broad, and its valves are less compressed than those of the typical variety, but the measurements overlap and in other respects there seem to be no differences.

I am prepared to be proved wrong in giving only varietal rank to Dr. Reitz's plant. But if I am right, this is an important precedent, and the relative status of similar pairs of taxa in this family, e.g. *Memora patula* and *M. schomburgkii*, *Phryganocydia corymbosa* and *P. phellosperma*, may have to be reconsidered.

Gardnerodoxa *Sandwith*, gen. nov. ; tribus *Bignoniearum*, nulla affinitate obvia, ob indumentum ramulorum inflorescentiaeque glanduliferum, folia simpliciter ternatim bipinnata foliolis basi profunde cordatis, cirrho apice simplici, formam calycis corollaeque anguste tubulosam, stamina e fauce exserta, ovula in quoque loculo paucissima valde peculiare.

Frutex ope cirrhorum scandens, ramulis velut inflorescentiis indumentum papilliformi-pilosulum glanduliferum insigne praebentibus sed consociebus glandularum in nodis inter petiolos ut videtur carentibus ; pseudostipulae foliaceae desunt. *Folia* simpliciter ternatim bipinnata, scilicet e 2 pinnis 5-foliolatis cirrhoque terminali apice simplici composita. *Inflorescentia* axillaris, thyrsoidea, formosa sed satis pauciflora, ramis bis (vel summis semel tantum) dichotome divisis 2–4-floris tantum, floribus dichasiorum centralibus haud evolutis. *Calyx* longe anguste tubulosus, apice 5-dentatus. *Corolla* rosea, membranacea, anguste tubulosa, extra omnino glabra, limbo parvo lobis alabastro imbricatis demum plus minusve reflexis. *Stamina* prope medium tubum inserta, zona pilorum circa insertionem carentia, filamentis cum antheris e corollae fauce exsertis ; antherarum thecae rectae, divaricatae, glabrae, connectivo haud conspicue producto ; pollinis granula sphaerica, libera, esulcata, areolata. *Discus* conspicuus, pulvinaris. *Ovarium* ellipsoideo-oblongum, sessile ; ovula pro loculo biseriata, in quaque serie paucissima. *Fructus* atque *semina* adhuc ignota.—Species unica, in regione campestri provinciae Piauhyensis Brasiliae boreali-orientalis crescens.

Gardnerodoxa mirabilis *Sandwith*, sp. nov. unica.

Frutex scandens ; ramuli subteretes pluricostati, siccitate purpurascentes, pilis patentibus brevibus inaequalibus albis pellucidis multi-

cellularibus apice glandulas saturate coloratas gerentibus necnon aliis papilliformibus eglanduliferis immixtis conspicue dense induti, consociebus glandularum in nodis haud visis. *Folia* simpliciter (scilicet pinnis 1-jugis) ternatim bipinnata, cirrho nonnunquam (an semper ?) simplici terminata, petiolo rhachi pinnarum petiolulis cirrho omnibus indumento ramulorum praeditis, praeterea petiolo pilis tenuibus simplicibus subadpresse crispule ascendentibus nonnunquam praedito ; petiolus 1·3–2·5 cm. longus ; pinnae 1-jugae, 5-foliolatae, illae foliorum inferiorum foliolo terminali incluso ad 23·5 cm. longae sed ceterae superne gradatim minores ac in foliis summis nonnunquam 3 cm. tantum longae, internodiis rhacheos 2 circiter 6 cm. longis, petiolulis infimis 2–2·2 cm. longis superioribus brevioribus sed terminali 3–3·5 cm. longo, his omnibus supra canaliculatis in foliis superioribus pro rata gradatim brevioribus ; foliola late ovata suborbicularia vel terminalia obovato-suborbicularia, apice rotundata vel truncata vel saltem obtusa, mucronulata, basi profunde cordata, in foliis inferioribus 6–9 cm. longa, 5–8·5 cm. lata, superne gradatim multo minora ac in foliis summis 1–1·8 cm. longa 0·5–1·2 cm. lata, chartacea, basi 7–8-nervia, discoloria, siccitate superne nigrescentia subtus ob indumentum albida vel saltem grisea, supra glabra nervis canaliculato-impressis, subtus lanato-tomentosa lana demum aliquantum detersili costa nervisque primariis prominentibus ac indumento ramulorum glandulifero supra descripto praeditis venulis laxe reticulatis ac in foliolis majoribus sub lana prominulis. *Inflorescentia* axillaris, thyrsum formosum sed haud multiflorum ad 20 cm. longum 15 cm. latum praebens, siccitate purpurascens, ubique indumento ramulorum glandulifero denso praedita ; rami inferiores bis cum 4 floribus superiores semel cum 2 floribus tantum dichotome divisi ; pedunculi ramorum crassi, infimi ad 5·5 cm. longi ; bracteae oblongae vel lanceolatae, cymbiformes, 3·5–5 mm. longae ; bracteolae similes sed minores ; pedicelli 1–2 cm. longi. *Calyx* longissime satis anguste tubulosus, alabastro tantum apicem versus attenuatus, 3 cm. longus, 4·5–5·75 mm. latus, apice dentibus basin versus deltoideis tum filiformi-subulatis 2·5–4 mm. longis terminatus, membranaceus, de dentibus longitudinaliter obscure tantum 5-costatus, indumento inflorescentiae ceterae praeditus. *Corolla* teste lectore rosea, anguste tubulosa, 4·5–5 cm. longa, membranacea ; tubus parte inferiore in calyce inclusa valde angusta 2·5–3 mm. lata, parte superiore super calyce ad 5 mm. latitudine ampliata, extra omnino glaber, intus glaber nisi zona glandularum sessilium lata aliquantum sub insertione staminum disposita et circiter ad 1·5 cm. supra tubi basin attingente praeditus ; limbus 1–1·8 cm. diametro, utrinque glaber, lobis flore aperto plus minusve reflexis orbicularibus apice rotundatis 8 mm. longis atque latis. *Stamina* 2·8 cm. supra tubi basin inserta, longiora 2·7 cm. breviora 2·1 cm. longa, filamentis glabris e corollae fauce cum antheris conspicue exsertis, zona pilorum basi omnino carentibus ; antherarum thecae rectae, divaricatae, glabrae, 3–3·5 mm. longae, connectivo ut videtur in gibbum orbicularem apice rotundatum brevissimum circiter 0·2 mm. longum producto ; staminodium non visum. *Discus* magnus, pulvinaris, 1·75 mm. altus, apice irregulariter sinuatus. *Ovarium* ellipsoideo-oblongum, 3·5 mm. longum, 1·75 mm. latum, dense glanduloso-lepidotum, flavo-brunneum ; stylus 5·2 cm. longus, inferne glanduloso-lepidotus, superne glaber, e

corollae fauce conspicue exsertus, stigmatibus elliptico-oblongis vix 2 mm. longis 0·75 mm. latis ; ovula in quoque loculo biseriata, pauca, in quaque serie tantum 3. *Fructus* non visus.

Brazil. Piauhy : near Algadões, July 1839, *Gardner* 2677 (type in Kew Herb., isotype in Herb. Brit. Mus.). " A climber. Flowers pink".

Algadões, where George Gardner stayed from July 29th–31st, 1839, is in *chapada* country about 100 miles S.W. of Oeiras, towards Parnaguá.

The British Museum sheet of the type collection was identified as *Bignonia exserta* DC. by Seemann, but that name was an illegitimate substitution for *Bignonia elegans* Vell., a wholly different plant which has been usually known as *Adenocalymma elegans* (Vell.) Bur. and was recently transferred to the genus *Pseudocalymma* as *P. elegans* (Vell.) Kuhlm., see Rodriguesia, **5,** 365–6 and tt. (1941).

This extraordinary plant presents a combination of interesting characters found in no previously described genus of *Bignoniaceae*, yet each of these characters occurs somewhere or other in one or more of the genera of the tribe *Bignonieae*. At the moment I cannot suggest any genus or species of evident affinity, especially as the fruit and seeds are unknown. There is a resemblance to *Piriadacus erubescens* (DC.) Pichon (*Cuspidaria erubescens* (DC.) Bur.), which occurs in the same region, on account of the gland-tipped hairs of the indumentum (a character found in several wholly distinct species of *Bignoniaceae* growing in *chapada* country), the form of the inflorescence, calyx and corolla, and the exserted stamens, but this is offset by the bipinnate leaves, the very singular shape of the leaflets, the much longer calyx, the glabrous corolla, the absence of a villous zone round the insertion of the stamens, the presence of a zone of sessile glands some distance below that insertion, the esulcate pollen-grains, and the very few ovules in each loculus of the ovary. It is quite impossible to fit Gardner's plant into any other of the genera of climbers with bipinnate leaves, for instance, *Memora* and *Pleonotoma*, *Nestoria*, *Neojobertia* or *Perianthomega*, nor does it resemble any of the species of *Arrabidaea* with biternate leaves. Of these genera, *Memora* alone shares in combination the important characters of simple tendrils and esulcate pollen-grains, and this genus is wholly dissimilar in other respects, especially on account of its yellow corollas. Gardner's specimens might conceivably have been placed at one time in the large, heterogeneous genus *Arrabidaea*, which has simple tendrils, but this would be impossible to-day, if only on account of the absence of gland-fields at the nodes, the glabrous corolla and the esulcate pollen-grains.

The pollen-grains were examined by Prof. G. Erdtman, who kindly gave me a duplicate slide, with the following preliminary data : grains areolate, spherical (56 μ) ; areolar sexine thicker than nexine, reticulate (muri simpli- or duplibaculate ; lumina studded with small bacula or grana) ; interareolar areas insignificant. Thus they resemble, in some respects, the areolate, nonaperturate pollen-grains of *Sparattosperma*, *Delostoma* and *Mansoa difficilis* in the *Bignoniaceae*, and also those of *Martynia*. Unfortunately, none of these genera, two of which are in a different tribe while one belongs to a different family, shows any macroscopic affinity with *Gardnerodoxa*, nor can I detect any relationship between the latter and any of the genera of the tribe *Bignonieae* which

Urban lists as possessing unfurrowed pollen-grains (see Ber. Deutsch. Bot. Ges. **34,** 733).

Gardner's specimens were collected more than a century ago and I have seen nothing resembling them in European herbaria or among consignments sent to me for identification from America. At the moment there seems to be no prospect of rediscovery. I therefore have no hesitation in describing such a very striking plant as a new genus, even in the absence of fruit and seeds. But it is high time that an expedition visited the *campos*, *chapadas* and *catingas* of the north-eastern states of Brazil, where such very unusual species abound, many of them known insufficiently from single collections. There must be large areas of Piauhy, Bahia, Maranhão, Ceará and Pernambuco which have never been examined by botanists since the days of Martius, Gardner, Blanchet and Ule.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : LVIII.*

The identity of Dioscorea cubijensis R. Knuth

N. Y. Sandwith

Disciphania cubijensis (*R. Knuth*) *Sandwith*, comb. nov.—*Dioscorea cubijensis* R. Knuth in Notizbl. Bot. Gart. Berlin, **7,** 202 (1917) and in Engler, Pflanzenreich, **4,** 43, p. 129 (1924) ; Macbride, Fl. Peru, part **1,** no. 3, 698 (1936).

My attention was drawn to the dubious identity of *Dioscorea cubijensis* by Mr. I. H. Burkill, who was surprised by the facies of the Kew material of this species, which is placed in Knuth's monograph of *Dioscorea* by the side of *D. trifoliata* H.B.K. as the only other member of his section *Trifoliatae*. The species was based upon a single collection with very young and, I believe, quite immature male inflorescences made by E. Ule (no. 9379) in January, 1912, near Cobija in the Rio Acre region of Amazonian Bolivia (Cobija itself appears to lie just within the Brazilian Territorio do Acre, but " Bolivia " is expressly written on the label of *Ule* 9379). A good isotype specimen is in the Kew Herbarium where there is also another collection, viz. *Steinbach* 7458, from forests of the Rio Palometillas, Prov. Sara, Dept. Santa Cruz, Bolivia, at 400 m., Feb. 1926. The Steinbach material, which was identified at Berlin as *D. cubijensis* (but a later hand has pencilled a mark of interrogation on the label), consists of one branchlet with two detached 4-5-foliolate leaves and another separate branchlet with a fine long female inflorescence bearing

*Continued from K.B., 1954, p. 614 (1955).

small, grape-like fruits about 1 cm. long and 8–9 mm. broad. Comparison of this material with Ule's specimen leaves no doubt that the two collections are conspecific (although Ule's leaves are only 3-foliolate) and that the fruiting branchlet of *Steinbach* 7458 can be associated with the foliage on the same sheet.

With such fruit, the position of *D. cubijensis* in *Dioscorea* becomes untenable. Mr. Burkill suggested a search in *Menispermaceae*, a family with dioecious lianas presenting a strikingly similar facies, among which species with 6 subequal sepals and 3 free stamens can be found. It was soon discovered that the young male inflorescence of *Dioscorea cubijensis*, with its tiny, pubescent, sessile flower-buds, matches very well those of certain species of the genus *Disciphania*, in the *Tinosporeae* (cf. especially the young inflorescences of the Central American species, *Disciphania cardiophylla* Standl. and *D. coriacea* Standl.). A fruit of *Steinbach* 7458, after boiling, immediately showed the characteristic endocarp of this genus with 8 sharp ridges or wings which become lacerate-fimbriate on their margins. The male flowers of *Ule* 9379, on dissection, showed some minute scale-like petals attached to the base of the sepals which were evidently missed by Knuth. Only 3–4 of these were found in each flower : they are membranous (not fleshy), unequal, obovate-oblong or elliptic, up to 0·75 mm. long, and some were found to be very minutely clawed at the base. The 3 stamens are much longer than the petals and have conspicuous filaments and introrse anthers. With such characters of the petals and stamens, *D. cubijensis* seems to approach *Disciphania peltata* (K. Schum.) Diels which was originally described as a distinct genus, *Taubertia peltata*, by Schumann. The 3–5-foliolate leaves, however, with the conspicuous petiolules and the distinctive scattered-pilose indumentum on the lower surface of the leaflets, taken in conjunction with the floral characters, separate *D. cubijensis* from the material of known species of the genus. Another noteworthy feature is in the thecae of the anthers which are elliptic-oblong, parallel and more or less contiguous, closely resembling those of the anthers of *D. Ernstii* Eichl. as figured in Jahrb. Bot. Gart. Berlin, **2,** t. 12, f. 4a (1883).

With the evidence available I have no hesitation in assigning *Dioscorea cubijensis* to *Disciphania*, but it is obviously desirable, not only that female flowers should be collected, but that the characters of fully developed male flowers should be studied, especially for the number, texture and shape of the petals, the length of the filaments and the shape of the anther thecae and their connective. The type collection of *D. cardiophylla* shows at each node a number of very immature male inflorescences, comparable to those of *D. cubijensis*, arising in a pseudo-paniculate manner (cf. Diels' description of the male inflorescences of *D. Killipii* and *D. modesta*) along a young short shoot which develops from a supra-axillary bud above an older axillary spicate inflorescence which, at two nodes, was still present with fully developed and quite large flowers at the time of collection. It may be expected, then, that the fully developed male flowers of *D. cubijensis* bear petals and stamens differing somewhat from those of the apparently immature buds found on *Ule* 9379. Again, it is possible, or even probable, that the same species, perhaps even the same individual, of such a genus as *Disciphania* can provide both simple, lobed and compound leaves. The species of *Disciphania* are rarely

collected and only intensive study of far more material than is at present available will give a clear definition of both the genus and its species.

I have seen no specimen of *Tessmann* 5349, from Iquitos, Loreto, Amazonian Peru, a collection cited under *Dioscorea cubijensis* in Macbride's Flora of Peru. It is interesting to note that several other related numbers of Ule's collection, e.g. 9380, 9381, 9383, 9388, 9389, represent species of *Menispermaceae*, the inference being that this collector sorted his gatherings into families before giving them numbers. I have retained Knuth's spelling *cubijensis*, although the place is spelled Cobija on the maps examined at Kew, and is so written on the Ule label distributed with the specimen of no. 9379.

Weed Control in Farm and Garden*.—This is primarily a text book for students of agriculture or horticulture and a handy reference book for farmers and horticulturalists.

The small-scale gardener may be unimpressed by details of expensive mechanical spraying machines and other equipment necessary for major wars against weeds but his interest has not been neglected. The author has thoughtfully provided conversion tables which will enable the reader to reduce commercial quantities of, for example, hundredweights per acre, to back-garden proportions of ounces per square yard—a small detail, but how often neglected, even in books intended primarily for amateur gardeners.

Other tables should be useful in providing the practical man with the information he wants, quickly, without having to search through the text. Subjects dealt with in this convenient form include quantities per acre required of various weedkillers for particular named weeds, the most suitable weedkillers for use in particular agricultural crops, and the best times at which to use them.

Selective, non-selective, and growth regulator weedkillers are discussed fully from various points of view, such as their uses against particular weeds and on particular crops, and the manner and timing of their application. Amongst the more important kinds are sodium chlorate, ammonium sulphate, copper chloride, B.O.V. (commercial sulphuric acid), light mineral oils, D.N.O.C., D.N.B.P., M.C.P.A., 2,4-D., 2,4,5-T, and C.M.U. References to recent literature are provided for those who wish to seek for further knowledge.

Despite the rapid development of chemical weedkillers, the value of sound cultural practices is not overlooked, and hand-weeding is given due consideration together with hoeing and various types of fallow.

S. G. Harrison.

* Weed Control in Farm and Garden. By Stephen J. Willis, B.Sc. (Agric.). Agricultural and Horticultural Students Series, General Editor J. Hunter Smith. Publ. by Vinton & Co. Ltd., 1954, pp. 184, price 8/6d. net.

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